PAGE'S WEEKLY.—October 20, 1905. Thin Paper Copy for Circulation Abroad.

NO. 58. VOL. 7. SIXPENCE. (REGISTERED AS A NEWSPAPER.) FRIDAY, OCTOBER 20, 1905.

PAGE'S WEEKLY

ENGINEERING · ELECTRICITY SHIPBUILDING MINING IRON & STEEL INDUSTRIES

EDITORIAL & PUBLISHING OFFICES, CLUN HOUSE, SURREY STREET, STRAND, LONDON, W.C.

FRANCE, Paris: 22, Rue de la Banque.
GERMANY, Berlin: 13, Unter den Linden.
RUSSIA, St. Petersburg: 14, Nevsky Prospect.
ITALY, Rome: 307 Corso.
AUSTRIA, Vienna: Kärntnerstrasse, nr. 30.

INDIA, Calcutta: Thacker, Spink & Co.
" Bombay: Thacker & Co., Ltd.
SOUTH AFRICA, Cape Town: Gordon & Gotch.
JAPAN, Yokohama: Kelly & Walsh, Ltd.
NEW ZEALAND: Gordon & Gotch, Ltd.

CANADA: Montreal News Company.
UNITED STATES, New York: International News Co.
" Chicago: Subscription News Co.
AUSTRALIA, Melbourne: Gordon & Gotch.
STRAITS SETTLEMENTS, Singapore: Kelly & Walsh, Ltd.

PAGE'S WEEKLY

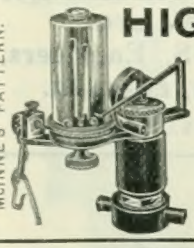
Miscellaneous

Mr. G. H. HUGHES, M.I.Mech.E.,

Consulting and Organising Engineer for Water Works and Industrial Undertakings,

19, OLD QUEEN ST., WESTMINSTER, S.W.

Telephone No.: 5754 Bank. Write for particulars.



HIGH SPEED INDICATORS.

Hannan & Buchanan,
75, Robertson Street, Glasgow.

ENGINE COUNTERS.
BOURDON GAUGES.

On Admiralty List.
Engineering Instrument Makers

A. MOUNT-HAES,

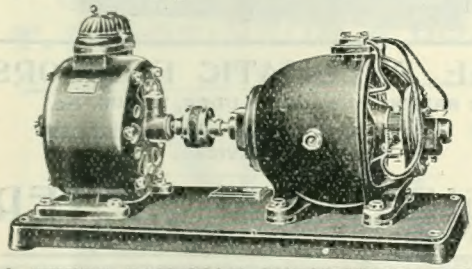
M.I.Mech.E., M.I.M.E.,

Consulting and Mining Engineer for Ore Dressing Plants of All Classes.

II, IRONMONGER LANE, LONDON. E.C.

Tel. Address: "DRESSINGS, LONDON." Telephone No.: 272 Central.

The Crypto Electrical Co.,



ALTERNATING TRANSFORMERS

3, TYERS GATEWAY, BERMONDSEY STREET, LONDON, S.E.

BRETT'S PATENT LIFTER CO., LTD.
COVENTRY, ENG.

Speciality—

FORGING PLANT.

See our Advertisement appearing Oct. 27th.

SEND FOR LATEST CATALOGUE.

Melville and Macalpine, Consulting Engineers and NAVAL ARCHITECTS,
615, WALNUT STREET, PHILADELPHIA, PA., U.S.A.

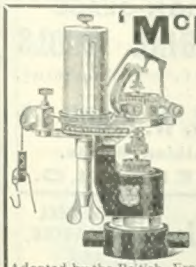
Rear-Admiral GEORGE W. MELVILLE, Ex-Engineer-in-Chief of the United States Navy, and JOHN H. MACALPINE, having a very extensive acquaintance in the best engineering circles in the United States, Britain, and the Continent of Europe, especially SOLICIT INTERNATIONAL BUSINESS.

PAGE & ROWLINGSON,

Chartered Patent Agents.

Mr. PAGE, who is a Whitworth Exhibitioner and an Associate Member of the Institute of Civil Engineers, has had a large experience as a Practical Mechanical Engineer, and is specially qualified to deal with the most intricate mechanical problems successfully. *Write for Handbook of Information Free.*

28, NEW BRIDGE STREET, LONDON, E.C.,
And 14, St. Ann's Square, Manchester.



'McINNES-DOBBIE' INDICATORS.

In Two types: External and Enclosed Pressure Springs.
Each made in several forms and sizes to suit all speeds and pressures.
Special Indicators for Gas, Winding, and Ammonia Engines, and for Motor-Cars.

DOBBIE, McINNES, LIMITED,
45, BOTHWELL ST., GLASGOW.

Adopted by the British, French, and Japanese Admiralties.

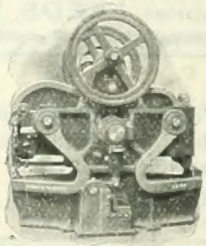
BABCOCK & WILCOX, Ltd.

PATENT WATER-TUBE BOILERS.

These Boilers are in use throughout the world to the extent of 4,700,000 h.p. generating steam for all purposes, and fired with all kinds of fuel.

See our Advertisement appearing Oct. 27th, page 37.

HEAD OFFICES—Oriel House, Farringdon Street, LONDON, E.C.
WORKS—Renfrew, SCOTLAND.



PUNCHING & SHEARING Machines.
STEAM HAMMERS.
Shipbuilders' MACHINE TOOLS.

DAVIS & PRIMROSE,

Leith Ironworks, EDINBURGH.

WAYGOOD LIFTS

APPLY FOR CATALOGUE.

FALMOUTH ROAD, LONDON, S.E.

DESTRUCTORS and CLINKER MACHINERY.

Horsfall Destructor Co., Ltd., Armley, Leeds.

Telegrams: "DESTRUCTOR." Telephone: 2006.
Codes: A.B.C. (5th Edition) and Leiber's.

The only firm in the United Kingdom who

SPECIALISE in the PHOTOGRAPHING of MACHINERY.

BOOKER & SULLIVAN, 67 & 69, Chancery Lane, LONDON, W.C.

TERMS ON APPLICATION. Telephone: 9252 CENTRAL.

PAGE'S WEEKLY

Miscellaneous

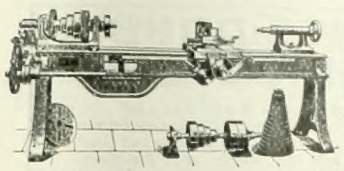
THE CASE IN A NUTSHELL.

You understand the Manufacture of the goods.
We understand the Effectual Advertising of them.

The combination of the two forces produces the desired result—increased sales.

We reiterate—our aim is not to increase your advertising expenditure, but to make that expenditure more productive. May we show you how?

THE BRITISH ADVERTISER SERVICE BUREAU,
Queen Anne's Chambers, Westminster, S.W.



HIGH-CLASS
MACHINE TOOLS
In stock for immediate delivery.

THOS. W. WARD, LD.
Albion Works,
SHEFFIELD.

WALTER SCOTT, LTD.,
LEEDS STEEL WORKS, LEEDS, ENGLAND.

MANUFACTURERS OF . . .

Rolled Steel Joists, Channels, etc.

Mild Steel Blooms, Billets, Slabs, Tinbars, Rounds and Flats.

Speciality: TRAMRAILS.

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FOR SAWS, PLANERS AND MOULDERS.

SAWMILL, FIREWOOD, and FIRELIGHTER MACHNERY

Enormous Profits Easily Made.

M. GLOVER & CO., Patentees, LEEDS.

TRANSPORTERS.

We have some interesting Working Models at Stand No. 171, Electrical Exhibition, Olympia.

See our Advertisement appearing Oct. 27th.

TEMPERLEY TRANSPORTER CO.,
72, Bishopsgate Street Within, LONDON, E.C.

A NEW GAUGE GLASS.
Samples, Lists, and Testimonials on applica on.

"S.H.P."
Tested to 350 lb. Steam Pressure.

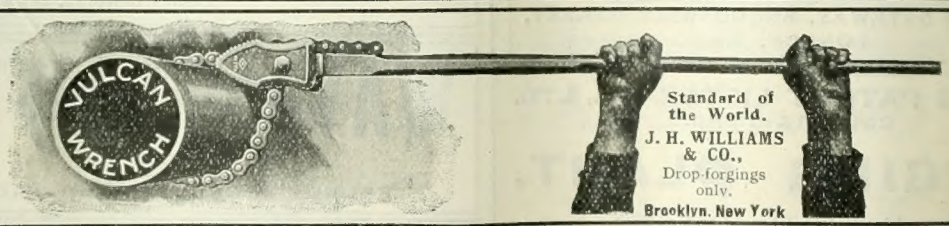
For High Pressure Boilers.

STONE BREAKERS,
GRAVEL WASHERS, ETC.
SAMUEL PEGG & SONS, Engineers,
LEICESTER, England.

SEND FOR ILLUSTRATED CATALOGUE.

SHONE PNEUMATIC EJECTORS
FOR RAISING SEWAGE, SLUDGE, WATER, &c.
Air Compressing Machinery
FOR ALL SERVICES.

HUGHES & LANCASTER
16, VICTORIA STREET, LONDON, S.W.



Standard of the World.
J. H. WILLIAMS & CO.,
Drop-forgings only.
Brooklyn, New York

WEST PASCAGOULA CREOSOTING WORKS,
WEST PASCAGOULA, MISS., U.S.A.

Situated on Pascagoula Bay and on the line or the Louisville and Nashville Railroad. These works have been in operation for more than twenty-six years. ORDERS for Creosoted Piles, Telegraph Poles, Cross Arms, Electric Conduits, Paving Blocks, Sawed Tiles, and Timber PROMPTLY EXECUTED New cylinders, 115 ft. long. Capacity, one million feet per month. A.B.C Code used. Cable address: Pierre, West Pascagoula, Miss.—Address. JNO. B. LINDSEY, Superintendent.

J. FREDK. MELLING,
14, Park Row, LEEDS, ENGLAND.

Iron & Steel Bars, Plates, Sheets, Girders, Channels, Angles, Rails, Blooms, Billets, & Slabs.

Write for Section Lists and Prices.

Telegrams: "LEGATION, LEEDS."

POWER, LIGHTING, AND HEATING.—A London firm, spending more than £1,500 yearly on these items, is considering proposals for reducing cost and adding to efficiency. Further suggestions are invited. Space is of importance.

Address, X 342, c/o "PAGE'S WEEKLY," CLUN HOUSE, SURREY STREET, W.C.

PAGE'S WEEKLY

Miscellaneous

BUYERS' DIRECTORY.

NOTE.—*The display advertisements of the firms mentioned under each heading can be found readily by reference to the Alphabetical Index to Advertisers on pages 22 and 24.*

In order to assure fair treatment to advertisers, each firm is indexed under its leading speciality ONLY.

Advertisers who prefer, however, to be entered under two or more different sections can do so by an annual payment of 5s. for each additional section.

Advertisers' Service Bureau.
British Advertiser Service Bureau, Queen Anne's Chambers, Westminster, S.W.

Artesian Well Machinery.
John Z. Thom, Patricroft, Manchester.

Band Sawing Machines.
Noble & Lund, Ltd., Felling-on-Tyne.

Belting.
Binney & Son, Catherine Street, City Road, London, E.C.
Cort, Arthur, & Co., Camberwell, London, S.E.
Fleming, Birkby & Goodall, Ltd., West Grove, Halifax.
Gilmour, W. & O., St. John's Hill, Edinburgh.

Boilers.
Clayton, Son & Co., Ltd., Leeds City Boiler Works, Leeds.
Grantham Boiler and Crank Co., Ltd., Grantham.
Hartley & Sugden, Ltd., Halifax.
Thompson, John, Wolverhampton.

Boilers (Water-tube).
Babcock & Wilcox, Ltd., Oriel House, Farringdon Street, London, E.C.
Stirling Boiler Co., Ltd., Motherwell, N.B.

Bolts, Nuts, Rivets, etc.
Herbert W. Periam, Ltd., Floodgate Street Works, Birmingham.
T. D. Robinson & Co., Ltd., Derby.

Books.
Griffin, Charles, & Co., Exeter Street, Strand, W.C.
New Zealand Mines Record, Wellington, New Zealand.
Spon, E. & F. N., 125, Strand, W.C.

Boring Machines.
Asquith, William, Ltd., Well Road Works, Halifax.
Niles-Bement-Pond Co., 23-25, Victoria Street, London, S.W.
Noble & Lund, Ltd., Felling-on-Tyne.

Case-Hardening Compounds.
Hy. Miller & Co., Millgarth Works, Leeds.

Castings.
Ashmore, Benson, Pease & Co., Ltd., Stockton-on-Tees.

Catalogues, Printing, &c.
Atlantic Press, Ltd., Weymouth Street, Manchester.
Spottiswoode Advertising Agency, Clun House, Surrey Street, Strand, W.C.
Stafford, Arthur, & Co., Denton, Manchester.

Chucks.
Fairbanks Co., 78-80, City Road, London, E.C.

Cisterns, Tanks, &c.
Ashmore, Benson, Pease & Co., Ltd., Stockton-on-Tees
F. A. Keep, Juxon & Co., Barn Street, Birmingham.

Clutches (Friction).
David Bridge & Co., Castleton Ironworks, Rochdale, Lancashire.

Coke Oven Expert.
Mallmann, P. J., 110-118, Victoria Street, S.W.

Condensing Plant.
Benn, Sykes, Haslingden, near Manchester.
Concentric Condenser, Ltd., 23, Northumberland Avenue, London W.C.
Mirrlees-Watson & Co., Ltd., Glasgow.

Consulting Engineers.
Gibbs, John, & Son, 80, Juke Street, Liverpool.
G. H. Hughes, A.M.I.M.E., 19, Old Queen Street, Westminster, S.W.
Melville & Macalpine, 615, Walnut Street, Philadelphia, Pa., U.S.A
Mount-Haes, A., M.I.Mech.E., M.I.M.E., 11, Ironmonger Lane, London, E.C.

Continental Railway Arrangements.
Northern Railway of France.
South Eastern & Chatham Railway Co.

Conveying and Elevating Machinery.
Adolf Bleichert & Co., Leipzig-Gohlis, Germany.
Fraser & Chalmers, Ltd., 3, London Wall Buildings, London, E.C.
Temperley Transporter Co., 72, Bishopsgate Street Within, London, E.C.

Coverings (Boiler).
Magnesia Coverings, Ltd., Washington Station, co. Durham.

Cranes, Travellers, Winches, etc.
Joseph Booth & Bros. Ltd, Rodley, Leeds.
Thomas Broadbent & Sons, Ltd., Huddersfield.
Niles-Bement-Pond Co., 23-25, Victoria Street, London, S.W.

Cranks.
Clarke's Crank & Forge Co., Ltd., Lincoln, England.

Cutters (Milling).
Pratt & Whitney Co., 23-25, Victoria Street, London, S.W.
E. G. Wrigley & Co., Ltd., Foundry Lane Works, Soho, Birmingham

Destructors.
Heenan & Froude, 4, Chapel Walks, Manchester.
Horsfall Destructor Co., Ltd., Armley, Leeds.

Dredges and Excavators.
Delange & Cie, Mce., Hoboken, near Antwerp.
Rose, Downs & Thompson, Ltd., Old Foundry, Hull.

Drilling Machines.
Asquith, William, Ltd., Well Road Works, Halifax.
Niles-Bement-Pond Co., 23-25, Victoria Street, London S.W.
Noble & Lund, Ltd., Felling-on-Tyne.
Swift, George, Claremont Ironworks, Halifax.

Economisers.
E. Green & Son, Ltd., Manchester.

Ejectors (Pneumatic).
Hughes & Lancaster, 16, Victoria Street, London, S.W.

Electrical Apparatus.
Allgemeine Elektricitäts Gesellschaft, Berlin, Germany.
Broadbent, T. W., Victoria Electrical Works, Huddersfield.
Crypto Electrical Co., 3, Tyer's Gateway, Bermondsey Street, London, S.E.
Ebonestos Manufacturing Co., 22, Rosoman Street, London, E.C.
Gent & Co., Ltd., Faraday Works, Leicester.
Greenwood & Batley, Ltd., Albion Works, Leeds.
India Rubber, Gutta Percha, and Telegraph Works Co., Ltd., Silvertown, London, E.
Matthews & Yates, Ltd., Swinton, Manchester.
Mix and Genest, Berlin, W., Germany.
Nalder Bros. & Thompson, 34, Queen Street, London, E.C.
New Gutta Percha Co., Ltd., Dashwood House, New Broad Street E.C.
Newton Brothers, Full Street, Derby.
Phœnix Dynamo Manufacturing Co., Bradford, Yorks.
Scott, E., & Mountain, Ltd., Newcastle-on-Tyne.
Sturtevant Engineering Co., Ltd., 147, Queen Victoria Street, London, E.C.
Turner, Atherton & Co., Ltd., Denton, Manchester.
B. Weaver & Co. (*see* Ebonestos Manufacturing Co.), 22, Rosoman Street, Clerkenwell, London, E.C.

Engineers' Supplies.
Ahlers, Ad., Whitley Bay, near Newcastle-on-Tyne.

Engines (Gas).
Campbell Gas Engine Co., Ltd., Halifax.
Cundall, Son & Co., Ltd., Airedale Iron Works, Shipley.

Engines (Electric Lighting).
McLaren, J. and H., Midland Engine Works, Leeds.

Engines (Locomotive).
Baldwin Locomotive Works, Philadelphia, Pa., U.S.A.
Hunslet Engine Co., Ltd., Leeds, England.
Hudswell, Clarke & Co., Ltd., Leeds, England.
McLaren, J. & H., Midland Engine Works, Leeds.

Engines (Portable).
Garrett, R., & Sons, Leiston, R.S.O., Suffolk.

Engines (Stationary).
Allis-Chalmers Co., 533, Salisbury House, Finsbury Circus, London E.C.
Fraser & Chalmers, Ltd., 3, London Wall Buildings, London, E.C.
Garrett, R., & Sons, Leiston, R.S.O., Suffolk.
Mirrlees Watson Co., Ltd., Glasgow.

Engines (Traction).
Jno. Fowler & Co. (Leeds), Ltd., Steam Plough Works, Leeds.
Garrett & Sons, Ltd., Richard, Leiston, R.S.O., Suffolk.

Engravers.
Jno. Swain & Son, Ltd., 58, Farringdon Street, London, E.C.

Exhaust Steam Oil Separators.
Lancaster & Tonge, Ltd., Pendleton, Manchester.

Fans, Blowers.
Capel Fan Co., 13, Moseley Street, Newcastle-on-Tyne.
Davidson & Co., Ltd., "Sirocco" Engineering Works, Belfast, Ireland.
Gibbs, John & Son, 80, Juke Street, Liverpool.
James Keith & Blackman Co., Ltd., 27, Farringdon Avenue, London, E.C.
Matthews & Yates, Ltd., Swinton, Manchester.

Fire Bricks.
J. H. Sankey & Son, Ltd., Essex Wharf, Canning Town, London, E.

Buyers' Directory—(*Continued*).

Firewood Machinery.
M. Glover & Co., Patentees and Saw Mill Engineers, Leeds.

Fountain Pens.
Mabie, Todd & Bard, 93, Cheapside, London E.C.

Forging (Drop) Plants.
Brett's Patent Lifter Co., Ltd., Coventry.

Forgings (Drop).
J. H. Williams & Co., Brooklyn, New York, U.S.A.

Furnaces.
Deighton's Patent Flue & Tube Company, Vulcan Works, Pepper Road, Leeds.
Leeds Forge Co., Ltd., Leeds.
Masons Gas Power Co., Ltd., Alma Works, Levenshulme, Manchester.

Gas Producers.
Masons Gas Power Co., Ltd., Alma Works, Levenshulme, Manchester.

Gauge Glasses.
J. B. Treasure & Co., Vauxhall Road, Liverpool.
Tomey, J., & Sons, Aston, Birmingham.

Gauges (Pressure, Vacuum, and Hydraulic).
Dobbie, McInnes, Ltd., 45, Bothwell Street, Glasgow.

Gearing.
Ahlers, Ad., Whitley Bay, near Newcastle-on-Tyne.
Angus, G. & Co., Ltd., Newcastle-on-Tyne.
Asquith, William, Ltd., Well Road Works, Halifax.
Reid Gear Co., Linwood, near Glasgow.
Wild, M. B., & Co., Corporation Street, Birmingham.

Gold Dredging Plant.
Fraser & Chalmers, Ltd., 3, London Wall Buildings, London, E.C.

Greases.
Blumann and Stern, Ltd., Plough Bridge, Deptford, London, S.E.

Hack Saws.
Baynes, Charles, Knuzden Brook, Blackburn.

Hammers (Steam).
Davis & Primrose, Leith Ironworks, Edinburgh.
Niles-Bement Pond Co., 23-25, Victoria Street, London, S.W.

Hoisting Machinery.
See Conveying Machinery.

Horizontal Boring Machines.
Asquith, William, Ltd., Well Road Works, Halifax.
Greenwood & Batley, Albion Works, Leeds.
Niles-Bement Pond Co., 23-25, Victoria Street London, S.W.
Noble & Lund, Ltd., Felling-on-Tyne.

Hydraulic Leather.
Ahlers, Ad., Whitley Bay, near Newcastle-on-Tyne.

Hydraulic Machine Tools.
Niles-Bement-Pond Co., 23-25, Victoria Street, London, S.W.
Vauxhall and West Hydraulic Engineering Co. Ltd., 23, College Hill, London, E.C.

Icemaking and Refrigerating Machinery.
H. J. West & Co., 114-118, Southwark Bridge Road, London, S.E.

Indicators.
Dobbie McInnes, Ltd., 45, Bothwell Street, Glasgow.
Hannan & Buchanan, 75, Robertson Street, Glasgow.

Iron and Steel.
Allen, Edgar, & Co. Ltd., Imperial Steel Works, Sheffield.
Askham Bros. & Wilson, Ltd., Sheffield.
Consett Iron Co., Ltd., Consett, Durham, and Newcastle-on-Tyne.
Fairley & Sons, James, Old Mint, Shadwell Street, Birmingham.
Farnley Iron Co., Ltd., Leeds, England.
Fried. Krupp, Grusonwerk, Magdeburg-Buckau, Germany.
J. Frederick Melling, 14, Park Row, Leeds, England.
Parker Foundry Co., Derby.
Purden, John & Sons, Lambhill Forge, by Maryhill, Glasgow.
Walter Scott, Ltd., Leeds Steel Works, Leeds, England.

Ironwork (Constructional).
F. A. Keep, Juxon & Co., Barn Street, Birmingham.

Ironwork (Galvanised).
F. A. Keep, Juxon & Co., Barn Street, Birmingham.

Lagging Sheets.
Zeitz & Co., 21, Lime Street, London, E.C.

Lathes.
Asquith, William, Ltd., Well Road Works, Halifax.
Bradbury & Co., Ltd., Wellington Works, Oldham.
Eclipse Tool Manufacturing Co., Linwood, near Glasgow.
Leckenby, Benton, & Co., Perseverance Ironworks, Halifax.
Mitchell, D., & Co., Ltd., Central Ironworks, Lawkholme, Keighley.
Niles-Bement-Pond Co., 23-25, Victoria Street, London, S.W.
Noble & Lund, Ltd., Felling-on-Tyne.
Northern Engineering Co. (1900), Ltd., King Cross, near Halifax.
Swift, George, Claremont Ironworks, Halifax.

Lathe Carriers.
Williams, J. H., & Co., Brooklyn New York, U.S.A.

Laundry Machinery.
W. Summerscales & Sons, Ltd., Engineers, Phœnix Foundry, Keighley, England.

Lifts.
Waygood & Co., Ltd., Falmouth Road, London, S.E.

Lubricants.
Blumann & Stern, Ltd., Plough Bridge, Deptford, London, S.E.
Reliance Lubricating Oil Co., The, 19 & 20, Water Lane, Great Tower Street, London, E.C.
Matthew Wells & Co., Hardman Street Oil Works, Manchester.

Machine Tools.
Asquith, William, Ltd., Well Road Works, Halifax.
George Addy & Co., Waverley Works, Sheffield.
Bateman's Machine Tool Co., Hunslet, Leeds.
Beanland, Perkin, & Co., School Close Works, Leeds.
Bertrams, Ltd., St. Katherine's Works, Sciennes, Edinburgh.
Bradbury & Co., Ltd., Wellington Works, Oldham.
Breuer, Schumacher & Co., Ltd., Kalk, near Cologne-on-Rhine (Germany).
Consolidated Pneumatic Tool Co., Ltd., Palace Chambers, 9, Bridge Street, Westminster, S.W.
Cunliffe & Croom, Ltd., Broughton Ironworks, Manchester.
Dean, Smith & Grace, Ltd., Keighley.
Fengl, A., & Co., Grafton Street, Altrincham.
Greenwood & Batley, Ltd., Leeds.
Jones & Lamson Machine Co., 97, Queen Victoria Street, London, E.C.
John Lang & Sons, Johnstone, near Glasgow.
Luke & Spencer, Ltd., Broadheath, Manchester.
Mitchell, D., & Co., Ltd., Central Ironworks, Lawkholme, Keighley.
Jos. C. Nicholson Tool Co., City Rd. Tool Wks., Newcastle-on-Tyne.
Niles-Bement-Pond Co., 23-25, Victoria Street, London, S.W.
Noble & Lund, Ltd., Felling-on-Tyne.
Northern Engineering Co., 1900, Ltd., King Cross, near Halifax.
J. Parkinson & Son, Canal Ironworks, Shipley, Yorkshire.
C. Redman & Sons, Halifax.
Resides, 12, Aire Street, Brighouse, Yorks.
Rice & Co. (Leeds), Ltd., Leeds, England.
G. F. Smith, Ltd., South Parade, Halifax.
Swift, George, Claremont Ironworks, Halifax.
Taylor and Challen, Ltd., Derwent Foundry, Constitution Hill, Birmingham.
Vauxhall and West Hydraulic Engineering Co., Ltd., 23, College Hill, London, E.C.
H. W. Ward & Co., Lionel Street, Birmingham.
T. W. Ward, Albion Works, Sheffield.
West Hydraulic Engineering Co. (see Vauxhall and West Hydraulic Engineering Co. Ltd.), 23, College Hill, London, E.C.
Winn, Charles, & Co., St. Thomas Works, Birmingham.
Yorkshire Machine Tool and Engineering Works, Liversedge, Yorks.

Marks.
Pryor, Edward, & Son, 68, West Street, Sheffield.

Metals.
Delta Metal Co., Ltd., East Greenwich, London, S.E.
Magnolia Anti-Friction Metal Co., Ltd., of Great Britain, 49, Queen Victoria Street, London, E.C.
Phosphor Bronze Co., Ltd., Southwark, London, S.E.

Metals (Perforated).
W. Barns & Son, Chalton Street, Euston Road, London, N.W.
Brown, Andrew, & Co., 110, Cannon Street, London, E.C.
Méguin, Fr., & Co., Ltd., Engineering Works, Dillingen-on-Saar.

Mining Machinery.
Fraser & Chalmers, Ltd., 3, London Wall Buildings, London, E.C.

Office Appliances.
Halden & Co., J., 8, Albert Square, Manchester.
Hall & Co., B. J., 39, Victoria Street, London, S.W.
Inglesant, T., & Sons, Ltd., Atlas House, Leicester.
Lyle Co., Ltd., Harrison Street, Gray's Inn Road, London, W.C.
Rockwell-Wabash Co. Ltd., 69, Milton Street, London, E.C.
Shannon, Ltd., Ropemaker Street, London, E.C.
Trading and Manufacturing Co., Ltd., Temple Bar House, Fleet Street, London, E.C.

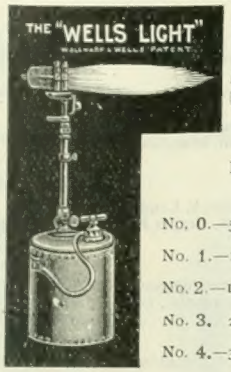
Oils, &c.
Blumann and Stern, Ltd., Plough Bridge, Deptford, London, S.E.
Valor Co., Ltd., Rocky Lane, Aston Cross, Birmingham.
Wells, M., & Co., Hardman Street Oil Works, Manchester.

Packing.
Beldam Packing & Rubber Co., 93-94, Gracechurch Street, London, E.C.
Frictionless Engine Packing Co., Ltd., Hendham Vale Works, Harpurhey, Manchester.
Lancaster & Tonge, Ltd., Pendleton, Manchester.
Redfern & Co., S., Swan Lane, New Brown Street, Manchester.
Quaker City Rubber Co., Coronation House, Lloyd's Avenue, E.C.
United States Metallic Packing Co., Ltd., Bradford.
J. Bennett von der Heyde, 6, Brown Street, Manchester.

Paper.
Lepard & Smiths, Ltd., 29, King Street, Covent Garden, London, W.C.

Patent Agents.
Page & Rowlingson, 28 New Bridge Street, London, E.C.

PAGE'S WEEKLY — Wells Specialities



PORTABLE LIGHT FROM OIL
UP TO 4,000 CANDLE POWER.

Adopted by 26 Governments and all Leading Firms. Over 1,500 supplied to British and Foreign Railways.

EACH LAMP GUARANTEED.

Horizontal Flame Unaffected by Weather.

OVER 18,000 SOLD

	PRICE COMPLETE.
No. 0.—500 Candles, small hand pattern, for petroleum	£7 7 0
No. 1.—1,500 Candles, hand pattern, with No. 2 size burner for Tar Oil ...	£10 0 0
No. 2.—1,500 Candles, useful and portable pattern	£15 10 0
No. 3. 2,500 Candles, Manchester Ship Canal pattern	£16 10 0
No. 4.—3,500 Candles. A most powerful lamp...	£17 15 0

These Lamps are arranged to burn Kerosene or Petroleum when sent to Foreign Countries; but in Great Britain our Special Wells Oil is supplied, which is half the price, and gives 30 per cent. more light. Special prices for our oil may be had on application to our Agents or direct to us.

No. 50 "STANDARD" LAMP.

For Electrical Engineers, Contractors, Builders, Docks, Railways, &c.

This Lamp will not blow out in a high wind, produces a clear white light of about 200 candle power, from ordinary paraffin or petroleum. The tank holds 1½ gallons of oil burning six hours.

Price **£3** each.

Extra Burners **3/-** each.

WELLS' OIL GAS GENERATING LAMP No. 40.

Weight, 10 lb. Capacity, 7 pints. Burning about 7 hours.

Made in Sheet Steel, with top and bottom of our "Unbreakable" Metal, for Lightness and Strength, with large Capacity.

Price, with Single Burner...	16/- each.
,, Double ,, ...	19/- ,,
Tripod Stands	3/- ,,
Extra Burners	2/- ,,

A. C. WELLS & Co.,

100a, Midland Road, St. Pancras,

LONDON, N.W.

WELLS' "LIGHTNING PAINTER."

(WALLWORK AND WELLS' PATENTS.)

PAINTING BY MACHINE.

Great Saving in Time, Paint, and Labour.

PAINTING SPEED—3 square yards a minute.

The paint is sprayed evenly and continuously through a flexible tube and nozzle supplied with compressed air, either from existing air main or from our special Compressors.

No. 1 Painter (as above Illustration) ...	£25 0 0
No. 2 ,, ...	£30 0 0
No. 3 ,, ...	£35 0 0
Single Air Compressor	£17 10 0
Double Air Compressor	£27 0 0

HAND AIR COMPRESSORS, Paint Holder and Sprayer Combined.

Invaluable for ELECTRICAL WORK, STENCILLING, ORNAMENTING, DECORATING, &c., or any class of painting where the work is not very heavy or continuous.

Price, Complete ... ... £16.

Hand Sprayer and Hose supplied separately, **£9.**

Supplied to 12 Governments, principal Railways, and leading Firms in Great Britain.

VERTICAL STEAM ENGINE AND AIR COMPRESSOR.

Price £100.

No. 2 Painter, extra £30.

OVER 500 PLANTS SOLD.

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J. Halden & Co., 8, Albert Square, Manchester.
B. J. Hall & Co., 39, Victoria Street, London, S.W.

Photographers.
Booker & Sullivan, 67 and 69, Chancery Lane, W.C.
Elliott & Fry, 55, Baker Street, London, W.

Photographic Apparatus.
Marion & Co., Ltd., 22 and 23, Soho Square London, W.

Pinch Bars.
Samson & Co., Garforth, near Leeds.

Pipe Wrenches (Chain).
Williams, J. H., & Co., Brooklyn, New York, U.S.A.

Pistons.
Lancaster & Tonge, Ltd., Pendleton, Manchester.

Planished Sheets.
Zeitz & Co., 21, Lime Street, London, E.C.

Porcelain.
Gustav Richter, Charlottenburg, near Berlin, Germany.

Presses (Hydraulic).
Greenwood & Batley, Albion Works, Leeds
Niles-Bement-Pond Co., 23-25, Victoria Street, London, S.W.

Publishers.
Charles Griffin & Co., Ltd., Exeter Street, Strand, London, W.C.
Spon, E. and F. N., 125, Strand, W.C.
New Zealand Mines Record, Wellington, New Zealand.

Pumps and Pumping Machinery.
Drum Engineering Co., 27, Charles Street, Bradford.
Enke, Carl, Schkeuditz-Leipzig, Germany.
Fraser & Chalmers, Ltd., 3, London Wall Buildings, London, E.C.
J. P. Hall & Sons, Ltd., Peterborough.
Hathorn, Davey & Co., Ltd., Leeds, England.
Positive Rotary Pumps, Ltd., 23, Northumberland Avenue, London, W.C.
Tangyes, Ltd., Cornwall Works, Birmingham.

Radial Drilling Machines.
Asquith, William, Ltd., Well Road Works, Halifax.
Greenwood & Batley, Albion Works, Leeds.
Niles-Pement-Pond Co., 23-25, Victoria Street, London, S.W.
Noble & Lund, Ltd., Felling-on-Tyne.
Northern Engineering Co. (1900), Ltd., King Cross, near Halifax
Swift, George, Claremont Ironworks, Halifax.

Rails.
Wm. Firth, Ltd., Leeds.

Railway Wagons.
Nye, A. W., 110, Cannon Street, London, E.C.
W. R. Renshaw & Co., Ltd., Phœnix Works, Stoke-on-Trent.

Riveted Work.
F. A. Keep, Juxon & Co., Forward Works, Barn Street, Birmingham.

Roller Bearings.
Hyatt Roller Bearing Co., 47, Victoria Street, London, S.W.

Roofs.
D. Anderson & Son, Ltd., Lagan Felt Works, Belfast.
Head, Wrightson & Co., Ltd., Thornaby-on-Tees.

Ropeways (Aerial).
Bullivant & Co., Ltd., 72, Mark Lane, London, E.C.

Scientific Instruments.
Cambridge Scientific Instrument Co. Ltd., Cambridge.

Spanners.
Williams, J. H., & Co., Brooklyn, New York, U.S.A

Stampings.
Thomas Smith & Sons of Saltley, Ltd., Birmingham.
Williams, J. H., & Co., Brooklyn, New York, U.S.A.

Stamps (Rubber).
Rubber Stamp Co., 1 & 2 Holborn Buildings, Broad Street Corner, Birmingham.

Stamps (Metal).
Edward Pryor & Son, 68, West Street, Sheffield.

Steam Traps.
British Steam Specialties, Ltd., Fleet Street, Leicester.
Lancaster & Tonge, Ltd., Pendleton, Manchester.

Steam Wagons.
Thornycroft & Co., Ltd., J. I., Chiswick, London, W.
Yorkshire Patent Steam Wagon Co., Pepper Road, Hunslet, Leeds.

Steel Tools.
Saml Buckley, St. Paul's Square, Birmingham.
Pratt & Whitney Co., 23-25, Victoria Street, London, S.W.

Steel Structures.
Ashmore, Benson, Pease & Co., Ltd., Stockton-on-Tees.

Stokers.
Ed. Bennis & Co., Ltd., Bolton, Lancs.

Stone Breakers.
S. Pegg & Son, Alexander Street, Leicester.

Superheaters.
A. Bolton & Co., 40, Deansgate, Manchester.

Time Recorders.
Howard Bros., 40, Paradise Street, Liverpool, and 100b, Queen Victoria Street, London, E.C.
Recorders, Ltd., 171, Queen Victoria Street, London, E.C.

Tubes.
Premier Boiler Tubes, Ltd., 28, Victoria Street, London, S.W.
Thomas Piggott & Co., Ltd., Spring Hill, Birmingham.
Tubes, Ltd., Birmingham.

Turbines.
Greenwood & Batley, Albion Works, Leeds.
S. Howes Co., 64, Mark Lane, London, E.C.

Typewriters.
Empire Typewriter Co., 77, Queen Victoria Street, London, E.C.
Yost Typewriter Co., 50, Holborn Viaduct, London, E.C.

Valves.
Holmes & Co., W. C., Huddersfield.
Hopkinson, J. & Co., Ltd., Britannia Works, Huddersfield.
Hunt & Milton, Crown Brass Works, Oozells Street North, Birmingham.
Scotch and Irish Oxygen Co., Ltd. Rosehill Works, Glasgow.
Shaw, Joseph, Albert Works, Huddersfield.
Wian, Charles, & Co., St. Thomas Works, Birmingham.

Ventilating Appliances.
Matthews & Yates, Ltd., Swinton, Manchester.

Water Softeners and Purifiers.
Lassen & Hjort, 52, Queen Victoria Street, London, E.C.

Wagons—Steam.
Thornycroft & Co., J. I., Ltd., Chiswick, London, W.

Weighing Apparatus.
W & T. Avery, Ltd., Soho Foundry, Birmingham, England.
Samuel Denison & Son, Hunslet Moor, near Leeds.

Wells Light.
A. C. Wells & Co., 100A, Midland Road, St. Pancras, London, N.W

Wire Working Machinery.
Ed. Brand 35, Shakespeare Street, Manchester.

"Woodite."
"Woodite" Company, Mitcham, Surrey.

PAGE'S WEEKLY

Miscellaneous

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WITH DOUBLE CIRCULATION.

IMPROVED BOX AND "FIELD" TUBES. (PATENTED.)

Simple and Reliable. Readily Applied. Inexpensive.

Saves 10 to 15 [illegible]

s made of Steel throughout.

A large number working in—
Textile Mills,
Paper Works,
Collieries,
Electricity Stations,
Flour Mills, etc.

Suitable for any Working Pressure up to 200 lbs. per square inch.

Approved of by Leading Engineers and Insurance Co.'s.

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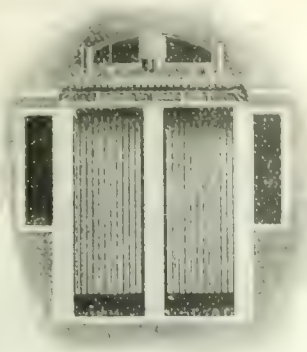
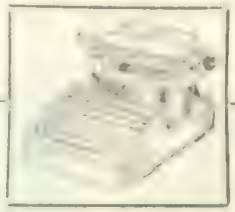


PATENTEES AND SOLE MAKERS:—

A. BOLTON & CO.,

Engineers and Superheating Specialists,

49, Deansgate, MANCHESTER.



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Catalogue and Particulars on Application.

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FOR THE BEST BOOKS BEARING ON THE INDUSTRIES DEALT WITH IN "PAGE'S WEEKLY," viz., ENGINEERING, ELECTRICAL, IRON AND STEEL, MINING AND SHIPBUILDING, ASK FOR CATALOGUE, CHARLES GRIFFIN & CO., LTD., 42, EXETER STREET, STRAND, LONDON, AND SEE SPECIAL ADVERTISEMENT ALTERNATE WEEKS.

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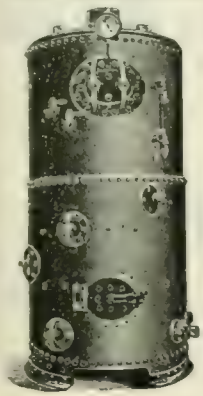
Signature
Journey
Speed

RECORDERS.

For further particulars . . of our . . see our whole page Ad. on [illegible]

TIME RECORDERS

RECORDERS, LTD., 171, Queen Victoria Street, LONDON, E.C.



Steam Boilers

(OF ALL TYPES AND POWERS).

Manufactured by

The GRANTHAM BOILER and CRANK CO., Ltd.,

GRANTHAM.

F. A. KEEP, JUXON, & CO.,

Manufacturers of

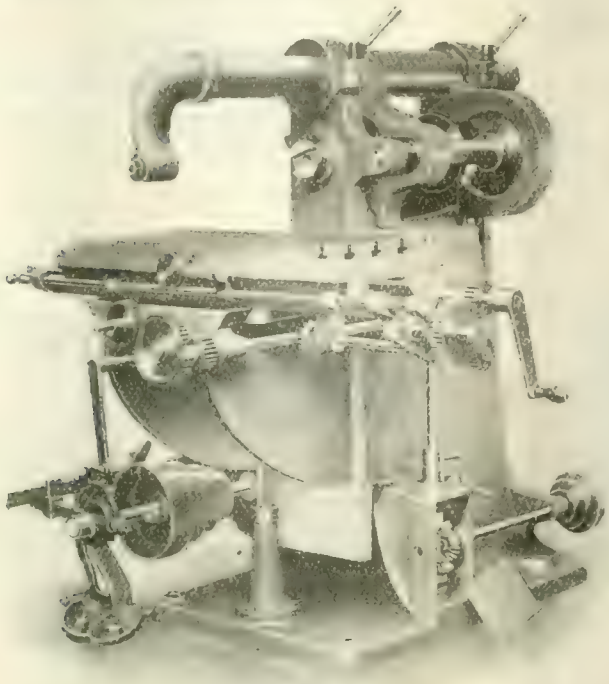
TANKS, CISTERNS

and CONSTRUCTIONAL IRONWORK.

Forward Works, Barn Street, **BIRMINGHAM.**

PAGE'S WEEKLY

Machine Tools



Geared
Milling Machines

For Milling at High Speeds

With RAPID RETURN OF TABLE

By Rack and Pinion.

Automatic Traverses of Table

21 inches transversely.
7½ inches longitudinally.

With reverse motions to both feeds.

Size of Table: 2 ft. 5 in. and 1 ft. 3 in.

CUNLIFFE & CROOM, LTD.

Broughton Lane,

MANCHESTER,

Code Word "BROOK" ENGLAND.

Telegrams: "MILLING, SHEFFIELD."
National Telephone No.: 985.

For the Latest and most Up-to-Date

HEAVY MACHINE TOOLS

PLATE BENDING MACHINE.

Also Special Lifting Jack for Electric Tramcars.

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GEORGE ADDY & Co.,

WAVERLEY WORKS, SHEFFIELD.

HIGH-CLASS LATHES & RADIAL DRILLS.

Write for our Lists.

Telegrams: Tools, Keighley."

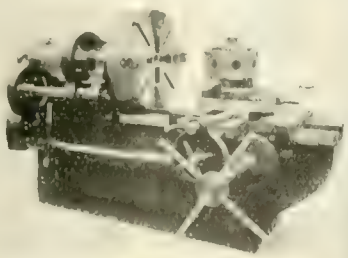
D. MITCHELL & CO., Ltd., Parsonage Works, KEIGHLEY.

On War Office and India Office Lists.

C. REDMAN & SONS

Parkinson Lane, HALIFAX.

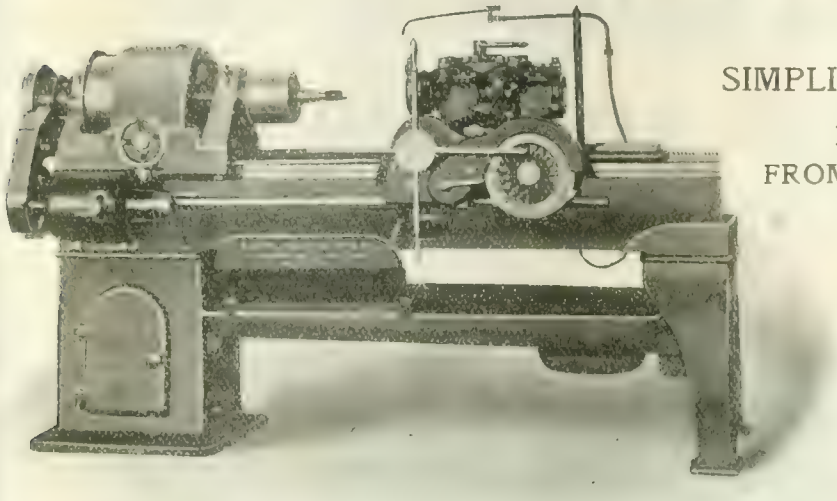
Established 1871.



LATHES, PLANERS, ETC., Our SPECIALITY.

PAGE'S WEEKLY — Machine Tools, &c.

TURRET LATHE SPECIALISTS.



Note the
SIMPLICITY of this LATHE.

DIRECT DRIVEN
FROM THE MAIN SHAFT.

VARIABLE SPEED HEADSTOCK.

The RACK and GUIDE direct under the cutting tool being completely covered.

ALL HANDLES and STOPS within reach of the Operator.
THE ONLY CORRECT GRIP CLUTCH.

Telegrams: "CRITERION, LINWOOD."
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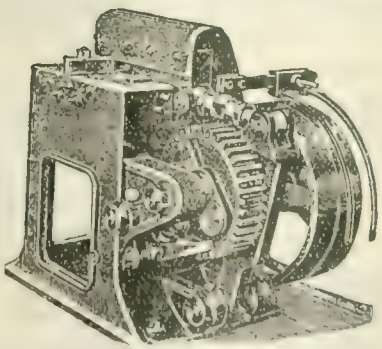
ECLIPSE TOOL MFG. CO., Linwood, nr. Glasgow.

C.W. Hasenclever Söhne DÜSSELDORF.

Special Machinery

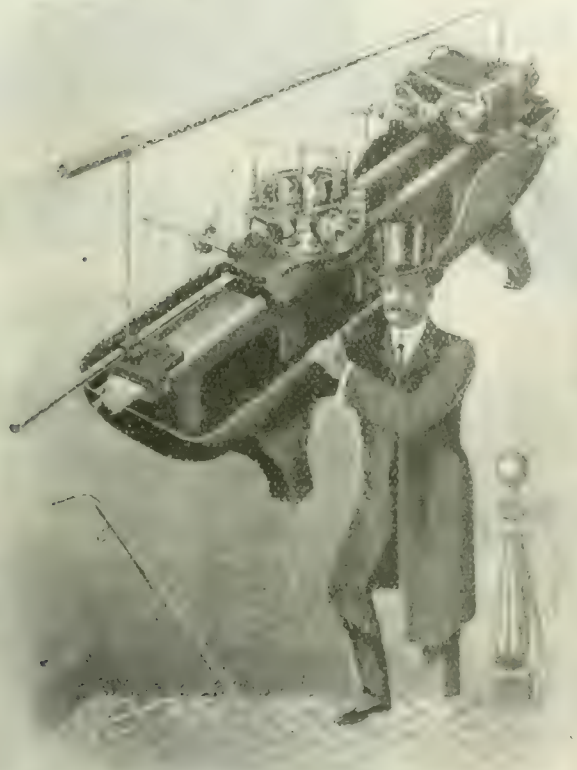
FOR MAKING

Bolts, Nuts, Rivets,
Insulator Brackets,
Horse-Shoes,
Horse-Shoe Nails,
Calkins, and
Similar Forgings.



ROLLING MACHINE FOR IRON SCREW THREAD.

It would be Impossible



For our Representative to carry a machine on his shoulder

when he comes to interview you regarding the purchase of a Hartness Flat Turret Lathe,

But, if you will call at our premises,

97, Queen Victoria Street, London, one of our expert operators will take very great pleasure in demonstrating to you the merits of our New Model Hartness Flat Turret Lathe, with Cross Sliding Head,

The only Turret Lathe of the kind on the Market.

COME AND SEE IT WORKING.

JONES & LAMSON MACHINE CO.,

"Jubilee Buildings," 97, Queen Victoria Street, LONDON, England.

TELEGRAMS: "TURRETORUM, LONDON. TELEPHONE NO. 5[illegible] BANK LONDON.

PAGE'S WEEKLY

Machine Tools

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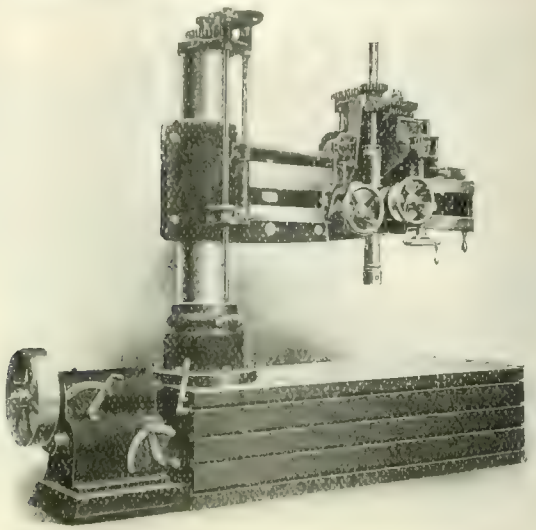
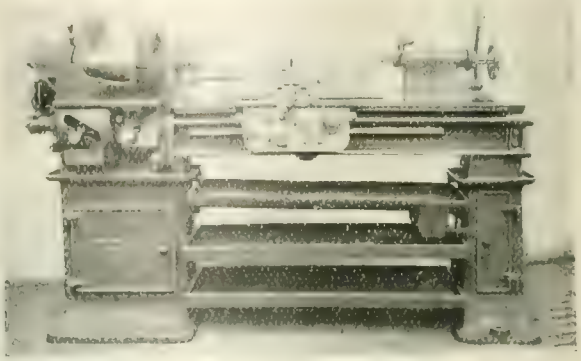
290, Claremont Road, HALIFAX.



Above is Illustration of my **6' 0" Radial**, with sixteen Speeds and nine Feeds, all obtained instantly by levers.

There are several special features in this and other tools made by me, and shall be glad to send full particulars on request.

6½ in. TOOL-ROOM LATHE.



J. PARKINSON & SON,

SHIPLEY, ENGLAND.

Cables: "TEMPLES, SHIPLEY."

COUNT THE CYCLES.

THIS is more accurate than gauging the efficiency of your planers by **maximum speeds only.** The time of a cycle (the complete "cut" and "return" journey) includes the loss due to acceleration at both **ends** of the stroke.

The High-Speed Planer illustrated completes **10 cycles in 4 minutes** when on a 12 ft. stroke.

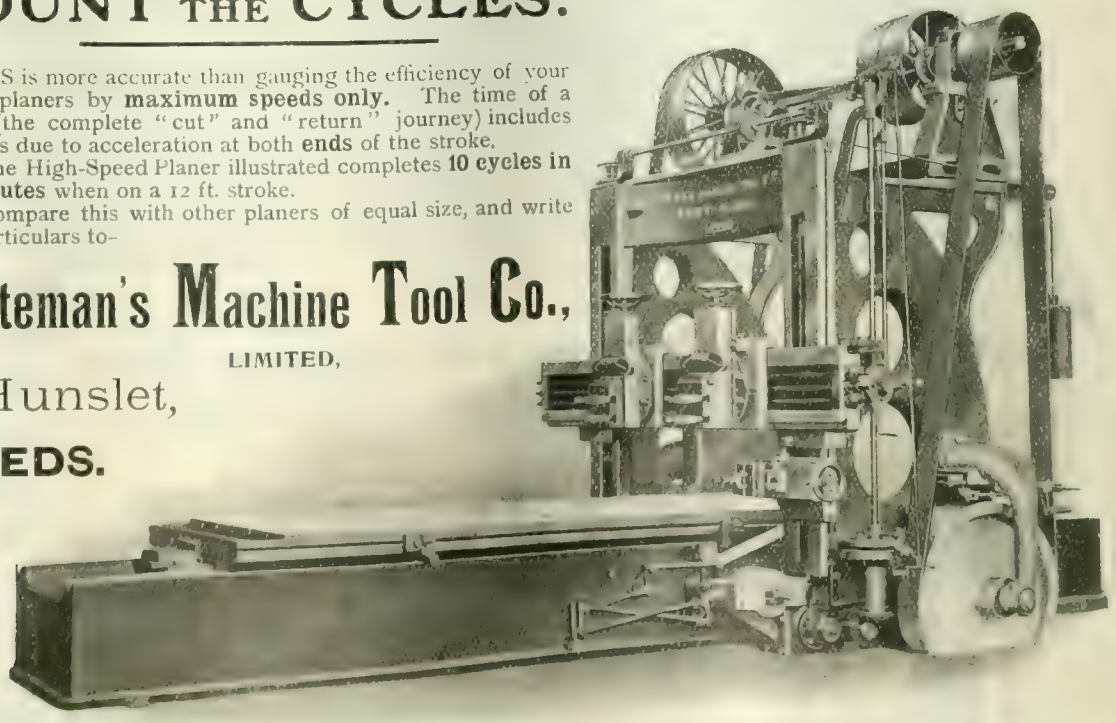
Compare this with other planers of equal size, and write for particulars to-

Bateman's Machine Tool Co.,

LIMITED,

Hunslet,

LEEDS.



60 x 60 x 12 ft. Patent High-Speed Planer, cutting 40 ft. p.m., returning 140 ft. p.m

PAGE'S WEEKLY — Machine Tools

Index to Advertisers.

Advertisements not appearing this week will be found by reference to the preceding or following issues, with the exception of those appearing monthly.

	PAGE
Addy, George, & Co. ..	14
Ahlers, Ad.	5
Allen, Edgar, & Co., Ltd	5
Allgemeine Elektricitäts-Gesellschaft	—
Allis-Chalmers Co.	—
Anderson & Son, Ltd., D.	43
Angus, G., & Co., Ltd. Inside Front Cover	
Ashmore, Benson, Pease & Co	10
Askham Bros. & Wilson, Ltd	5
Asquith, William, Ltd	15
Atlantic Press ..	—
Avery, Ltd., W. & T. ...	—
Babcock and Wilcox, Ltd. ..	3
Baldwin Locomotive Works ...	24
Bateman's Machine Tool Co.	18
Baynes, Charles	
Beanland, Perkin & Co. ..	13
Beldam Packing and Rubber Co	26
Benn, Sykes	25
Bennis & Co., Ltd., Ed.	33
Bertrams, Ltd.	5
Binney & Son	26
Bleichert & Co., A.	38
Blumann & Stern, Ltd....	25
Bolton & Co., A....	15
Booker & Sullivan	3
Booth & Bros., Ltd., Joseph Inside Back Cover	
Bradbury & Co., Ltd.	19
Brand, Ed.	5
Brett's Patent Lifter Co., Ltd. ...	3
Breuer, Schumacher & Co.	—
Bridge & Co., David	26
British Advertiser Service Bureau ...	4
British Steam Specialities, Ltd. ...	42
Broadbent & Sons, Ltd., Thos. ...	—
Broadbent, T. W. ...	
Brown, Andrew, & Co. Inside Front Cover	
Buckley, Samuel...	—
Bullivant & Co., Ltd.	9
Cambridge Scientific Instrument Co., Ltd.	41
Campbell Gas Engine Co. ..	2
Capell Fan Co.	42
Clarke's Crank & Forge Co., Ltd. ...	40
Clayton, Son, & Co., Ltd.	19
Concentric Condensers, Ltd.	34
Consolidated Pneumatic Tool Co., Ltd.	27
Cort, Arthur, & Co.	—
Crypto Electrical Co.	3
Cundall, Son & Co., Ltd.	23
Cunlifte & Croom Ltd.	14
Davidson & Co., Ltd.	36
Davis & Primrose	2
Dean, Smith & Grace, Ltd.	15
Deighton's Patent Flue & Tube Co., Ltd.	28
Delange & Cie, Mc.	16
Delta Metal Co., Ltd.	—
Denison S., & Son .	33
Dobbie-McInnes, Ltd	3
Drum Engineering Co	42
Ebonestos Manufacturing Co. ...	5
Eclipse Tool Manufacturing Co. ...	16
Elliott & Fry	1
Empire Typewriter Co....	—
Enke, Carl...	34
Fairbanks Co.	20
Fairley & Sons, James ... Outside Back Cover	
Farnley Iron Co., Ltd.	—
Fengl, A. & Co.	5
Firth, Ltd., William	—
Fleming, Birkby & Goodall, Ltd. ..	—
Fowler, John, & Co. (Leeds), Ltd. ..	28
Fraser & Chalmers, Ltd.	—
Frictionless Engine Packing Co., Ltd.	—
Garrett & Sons, Ltd., P.	—
Gent & Co., Ltd....	46
Gibbs, J., & Son	30
Gilmour, W. & O. .	20
Glover & Co., M.	4
Grantham Boiler and Crank Co., Ltd.	13
Green & Son, Ltd., E. .	—
Greenwood & Batley, Ltd.	24
Griffin & Co., Ltd, Charles	13
Hagan's Locomotive Works	—
Halden & Co., J.	—
Hall & Co., B. J.	44
Hall & Sons, Ltd., J. P. . ..	
Hannan & Buchanan	3
Hartley & Sugden	—
Hasenclever Söhne, C. W. . .	17
Hathorn, Davey & Co., Ltd.	
Head, Wrightson & Co., Ltd	3
Heenan & Froude ...	3
Holmes & Co., W. C.	30
Hopkinson, J., & Co., Ltd. . .	30
Horsfall Destructor Co. ..	3
Howard Bros.	40
Howes Co., S.	11
Hudswell, Clarke & Co., Ltd. . ..	
Hughes & Lancaster	4
Hughes, G. H.	3
Hunslet Engine Co. ..	28
Hunt and Mitton .. .	3
Hyatt Roller Bearing Co. .. .	34
India Rubber, Gutta Percha, and Telegraph Works Co., Ltd.	—
Inglesant, T., & Sons, Ltd.	22
Jones and Lamson Machine Co. .	1

Index to Advertisers—(Contd.)

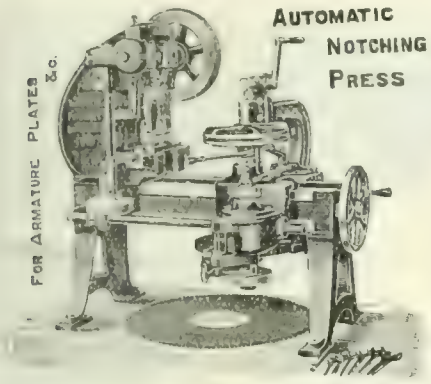
	PAGE
Keep, F. A., Juxon & Co. ..	13
Keith, J., & Blackman Co., Ltd.	
Krupp, Fried.	10
Lancaster & Tonge Ltd.	20
Lang & Sons, John	10
Lassen & Hjort ...	24
Leckenby, Benton & Co.	17
Leeds Forge Co., Ltd. ...	—
Lepard & Smiths, Ltd. ...	—
Luke & Spencer, Ltd. ..	—
Lyle Co., Ltd.	40
Maine, Todd & Bard	20
McLaren, J. & H.	28
Magnesia Coverings, Ltd.	30
Magnolia Anti-Friction Metal Co., Ltd	—
Mallmann, P. J. .. .	32 & 42
Marion & Co., Ltd.	43
Mason Gas Power Co., Ltd	—
Matthews & Yates, Ltd. Inside Front Cover	
Melling, J. F. ...	4
Melville and Macalpine	3
Miller & Co., Hy.	—
Mirrlees Watson Co., Ltd	35
Mitchell D. & Co., Ltd	14
Mix & Genest	41
Moore Hage, A. ..	3
Nalder Bros. & Thompson	—
New Gutta Percha Co., Ltd.	—
New Zealand Mines Record	44
Newton Bros.	37
Nicholson Tool Co., Jos. C.	19
Niles-Bement-Pond Co. ..	—
Noble & Lund, Ltd. ...	11
Northern Engineering Co. (1900), Ltd.	28
Northern Railway of France... ...	48
Page & Rowlingson . . .	3
Parker Foundry Co. .	40
Parkinson & Son, J.	18
Pegg & Sons, S.	4
Periam, Ltd., H. W.	36
Phœnix Dynamo Mfg. Co., Ltd	36
Phosphor Bronze Co., Ltd.,	

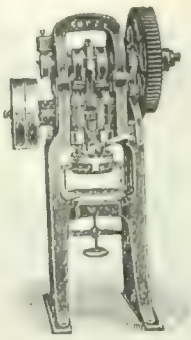
	PAGE
Piggott & Co., Ltd., Thos. . .	—
Positive Rotary Pumps, Ltd.... ...	34
Pratt & Whitney Co.	—
Pryor & Son Edward . .	—
Purden & Sons, John ... Outside Back Cover	
Quaker City Rubber Co.	—
Recorders, Ltd.	17
Redfern & Co., S.	—
Redman & Sons, C.	14
Reid Gear Co.	—
Reliance Lubricating Oil Co.	5
Rice & Co (Leeds), Ltd. .	13
Richardsons, Westgarth & Co., Ltd.	2
Richter, Gustav	—
Riter-Conley Manufacturing Co. .	—
Robinson & Co., Ltd., T. D. ..	8
Rockwell-Wabash Co., Ltd. ..	11
Roller, A.	43
Rose, Downs & Thompson, Ltd.	18
Rubber Stamp Co., The	1
Samson & Co.	—
Sankey & Son, J. H.	—
Schieren & Co., Chas. A.	42
Schnicke, H. F.	—
Scotch and Irish Oxygen Co., Ltd.	24
Scott, E. & Mountain, Ltd. ...	37
Scott, Walter, Ltd.	4
Shannon, Ltd.	30
Shaw, Joseph	28
Smith, Ltd., G. F. ...	10
Smith & Sons, of Saltley, Ltd., Thomas	—
South-Eastern & Chatham Railway...	48
Spon, E. & F.N.	—
Spottiswoode & Co., Ltd. ..	45
Stanford, Arthur, & Co.	47
Stamm, W.	16
Stirling Boiler Co., Ltd. Outside Back Cover	
Sturtevant Engineering Co., Ltd. ...	27
Süddeutsche Kabelwerke, A.-G. ...	22
Summerscales & Sons, Ltd., W. ...	19

	PAGE
Swain & Son, Ltd., John	47
Swift George .	8
Taylor & Challen, Ltd.	2
Temperley Transporter Co.	—
Thom John Z	35
Thompson, John.	—
Thornycroft & Co., Ltd., John I. ..	22
Tomey, J., & Sons .. .	4
Trading and Manufacturing Co., Ltd.	23
Treasure & Co., J. B.	41
Tubes, Ltd.	41
Turner, Atherton & Co.	8
United States Metallic Packing Co., Ltd.	24
Valor Co., Ltd.	12
Vauxhall and West Hydraulic Engineering Co., Ltd....	—
Von der Heyde, J. Bennett	24
Ward & Co., H. W.	—
Ward, T. W	4
Waygood & Co., Ltd.	3
Weaver & Co., B.	30
Weise & Monski. . . .	34
Wells & Co., A. C.	31
Wells & Co., M.	50
West & Co., Ltd., H. J.	27
West Hydraulic Engineering Co. ...	—
West Pascagoula Creosoting Works	4
Wild, M. B., & Co.	20
Williams & Co., J. H.	4
Winn & Co., Charles .	4
"Woodite" Co.	—
Wrigley & Co., Ltd., E. G.	—
Yorkshire Patent Steam Wagon Co.	28
Yorkshire Machine Tool and Engineering Works	
Yost Typewriter Co., Ltd.	18
Zeitz & Co.	5

PAGE'S WEEKLY

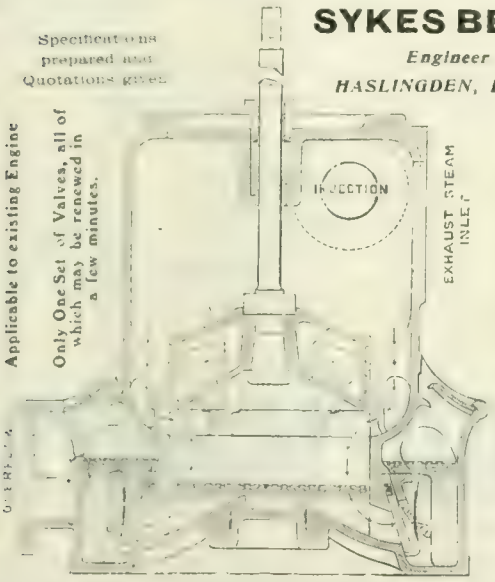
Miscellaneous





DRAWING PRESS.

Benn's Patent Combined Air-Pump, Condenser, and Delivery Box.



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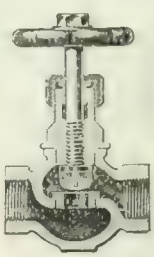

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PAGE'S WEEKLY Packing, Lubricants, &c.

PAGE'S WEEKLY

An Illustrated Technical Weekly, dealing with the Engineering, Electrical, Mining, Iron and Steel, and Shipbuilding Industries.

VOL. VII. LONDON, FRIDAY, OCTOBER 20, 1905. No. 58

The Offices of "Page's Weekly," Wednesday Evening.

THE findings of the London Traffic Commission would have cut a poor figure in the absence of the report of the advisory board of engineers which was issued last week, but it seems to us by no means desirable to attempt an analysis of the considerations upon which their conclusions were reached. The recommendations of the Commission have already been dealt with, and those who wish to master the intricacies of the problem in detail cannot do better than secure Vol. VII. and study the facts, figures, tables, and diagrams, which are packed into its 160 or more pages. We must not, however, neglect to congratulate the authors—Sir John Wolfe-Barry, Sir Benjamin Baker, and Mr. William Barclay Parsons upon the boldness and skill with which they have attacked one of the most complex problems of modern times. The fact which looms out painfully is that London is very much behind the age as regards traffic facilities, and it would be difficult to imagine a stronger case for a Central Board of Control than that which has been made out. It may be impossible to give effect to the vast schemes outlined in the Traffic Commission's report, but for the sake of the future, no less than for present convenience, it is imperative that a central authority should receive the speedy sanction of the legislature. In the meantime, the Kingsway, opened last Wednesday with such éclat, gives us a broad artery very much in line with the Commissioners' report. To the sixty municipal fathers of Paris who are our visitors this week, the present appearance of this great highway may suggest rather a siege than the Bois de Boulogne, but they will be glad, doubtless, to visit it at a later date when it is indeed a street, and at any rate they will learn with satisfaction that English engineers look upon Paris as a model of rational civic expansion.

MAURICE FITZMAURICE, C.M.G., M.INST.C.E., M.I.MECH.E.

Who, as chief engineer to the London County Council, was responsible for the engineering operations connected with Kingsway. Born in 1861, he was educated at Trinity College, Dublin, and was subsequently engaged on the Forth Bridge, the Blackwall Tunnel, and the Nile Dam at Assouan.

His Majesty the King was during the past week the central figure in another ceremony which in no less degree served to accentuate the extraordinary growth of the metropolis. We refer to the foundation-stone laying of the new Post Office buildings which are to occupy a large part of the site of Christ's Hospital. Several years will be occupied in the construction of these buildings, but when completed they will be devoted to the departments dealing with foreign and Colonial letters and letters for the City. The phenomenal growth of the postal service is illustrated by the fact that in the year following the introduction of the penny post 227,000,000 letters were delivered in the United Kingdom, an average of seven per head of the population, while last year over 4,479,000,000 of letters, postcards, halfpenny packets, newspapers, and parcels, were delivered, an average of 104·4 per head. Every week, in addition to other postal missives, London receives nearly 20,000,000 letters.

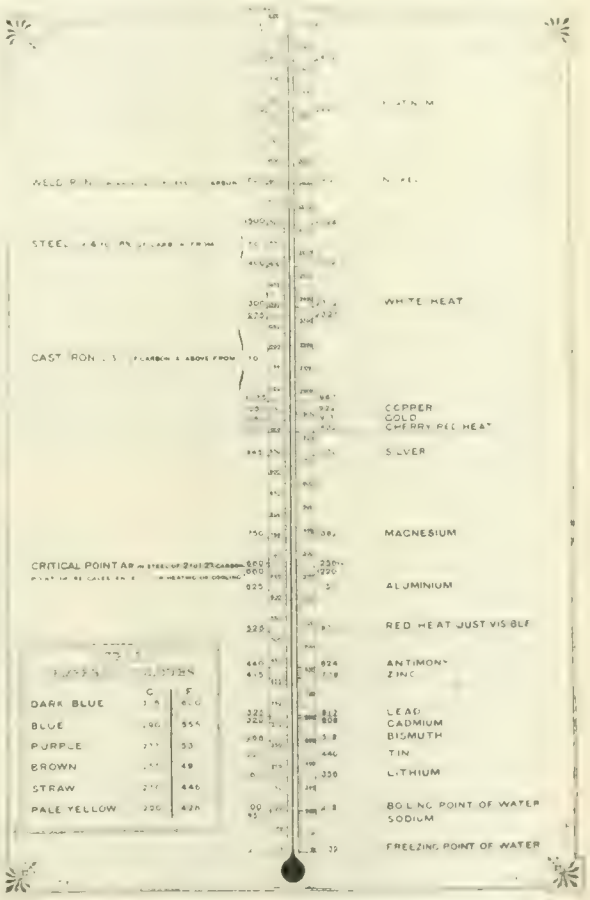
There are one or two conclusions reached by the Board of Trade inquiry into the accident on the Liverpool and Southport electric line which deserve attention. There would appear to be no greater danger with facing points than with trailing points, while there is stated to be no added risk in case of collision with the open corridor type of car in comparison with the separate compartment car. The danger from fire was also discussed, and so far as can be gathered from the results of the first bad collision on a railway worked by electric traction, there would seem to be no more risks in that connection than on a railway worked by steam. The collision itself in no way suggests any new danger to passengers arising out of the substitution of electric for steam traction. The accident is stated to have been due solely to inadvertence in leaving the siding points in the wrong position, and to the disregard of rules by a signalman and the driver of the train.

The Great Western Railway has lately completed the doubling of the last piece of single line which remained between London and Plymouth. We refer to the mile and a half between Dawlish and Teignmouth—one of the most picturesque runs in the kingdom. As long ago as 1888 Parliamentary powers were obtained to widen this section of the line, but it was not then proceeded with, and the delay is less to be wondered at when it is remembered that at this point, westward bound trains pass through no less than five tunnels in the old red sandstone cliffs before finally disappearing near what they call locally the Parson and Clerk rock. These tunnels in the aggregate account for 925 yards of permanent way, and in order to carry on the work without stopping the traffic, the engineers employed shield arches, 19 ft. in length, and of such height and width that they could be easily run into the tunnels. Inside there was ample space for the passage of trains, while outside the work of widening went on without fear of interruption, and was at times continued night and day. Several old caverns and headings, possibly at one time the haunts of smugglers, were encountered, and in one case the work was rendered more difficult by the presence of fine running sand. In one part a sea wall has been built, and exceptional care has been necessary in view of the ravages of the sea on this coast, the effects of which to anyone who has known it for fifteen or twenty years, are only too apparent. Until a year ago the work at this point was carried on by Mr. T. H. Gibbons, divisional engineer, Plymouth. It was concluded by Mr. Francis A. Brown, as resident engineer, under Mr. W. W. Grierson.

Any of our readers who visit the Photographic Exhibition at the New Gallery will find it worth while to stroll round the upper gallery, for here in modest obscurity is a collection of micro-photographs by Mr. S. E. Stead, F.S.A., Sir

William Roberts-Austen, and Messrs. F. W. Harbord and A. Campion, of Cooper's Hill. Metallurgical students can study the mysteries of ferrite, pearlite, cementite, and the rest, in photos a foot square. In one case, the alterations in the grain of steel produced by simple heat treatment are plainly represented, but these exhibits seem to mystify the casual observer, who is more attracted by the practical demonstrations in platinotype and colour work, etc., given down in the hall. They are certainly more creditable than many of the ordinary exhibits, some of which, if the truth must be told, are very "ordinary" indeed. There is, however, a great variety of up-to-date apparatus and accessories, and no amateur photographer is likely to come away without learning something.

In the course of a thoughtful article in the Monthly Review on the subject of "Imperial Consolidation by Telegraphy," Mr. Charles Bright raises a question which might with advantage be considered in connection with the forthcoming Colonial Conference. Although unfavourable to the State taking over the existing cable service as a commercial business, he considers there are overwhelming arguments in favour of a single trunk-system of cables connecting up the more important points of the British Empire under direct control (by ownership) of the State. He remarks that a cable system of this character would, *inter alia*, be free from all possible objections on the score of foreign shareholders. In Mr. Bright's opinion, this All-Red line should be reserved for Government service and news purposes, including, of course, its special mission for the Navy. In other words, such a service should not be contemplated as a commerical concern to compete with, or absorb, vested interests. A cable system of this character should be regarded as a political and strategic necessity of the age, in the same way that we regard our Navy—or, indeed, our Army, or any of the necessary services and expenses of the nation for which "safeguard" is our only return in times of peace, but which we could not do without as a provision for war, and, therefore, also as a provision for peace. Mr. Bright's contention is certainly worthy of very careful consideration. Anything to enhance the efficiency of our intelligence department in time of war will commend itself to the students of contemporary events. Incidentally, Mr. Bright expresses the hope that the existing cable companies will see their way to lower their tariffs, and that no agreements will be entered into by the State in future without this being provided for on a sliding scale.



A USEFUL THERMOMETER SCALE—
Fahrenheit and Centigrade—with melting and critical points of metals. By Hadfield's Steel Foundry Company, Ltd.

TECHNICAL SOCIETY NOTES.

The fourth [illegible] meeting of the Glasgow section of the Institution of Electrical Engineers will take place on October 27th, at the Grosvenor Hotel, Glasgow.

The Junior Institution of Engineers will hold its annual general meeting on the 27th inst., at the Westminster Palace Hotel. This will be the first meeting of the Incorporated Institution.

The Birmingham and District Electric Club opened its session last Saturday. Discussions and interchange of opinions filled up the evening. An extraordinary general meeting will be held at the Municipal Technical School, Suffolk Street, Birmingham, on Saturday, November 4th, when a paper (with demonstrations) will be read by Mr. J. H. Stansbie on "Electric Furnaces."

At a meeting of the Rugby Engineering Society, held yesterday, a paper, on "Electric Switch-gear" was read by J. Whitcher. In the report of the council for the session 1904–5 it is announced that two premiums were awarded by the British Thomson-Houston Company for the following Papers: "The Application of Electric Power to Collieries," by G. M. Brown; and "Pattern Making," by R. Watson. Excellent attendances are reported at the various meetings and visits.

On Saturday last, the fiftieth session of the Manchester Association of Engineers was commemorated by the holding of a conversazione at the Manchester Municipal School of Technology. The attendance numbered about 600. In order that the guests might have ample opportunities of viewing the many interesting rooms and the various machinery appertaining thereto, the principal departments throughout the school were thrown open for their inspection. In the department of physics and electrical engineering, there was a series of interesting lectures and demonstrations by members of the staff of the school, exhibitions being given in regard to X-rays, crystal growing, and other branches of popular science. An excellent programme of music and song was performed, and the jubilee session of the association made an auspicious start.

Mr. [illegible] has been appointed professor of mining at the Transvaal Technical Institute. Mr. J. Yates has had a distinguished professional career. He is an associate of the Royal School of Mines (first-class); National Scholar of the United Kingdom; first (bracket) on the list in the honours class of the Mining Examination; F.G.S London; member Institute Mining and Metallurgy, London. He was second on the competition for the De la Breche medal. Mr. Yates was for six years on the staff of the chief engineer of the Manchester Steam Users' Association, and was assistant general manager of the Bengal Gold and Silver Mining Company. He was for some years assistant consulting engineer of the Johannesburg Consolidated Investment Company, is a certificated mine manager (Transvaal), and for some considerable time was manager of the Balmoral Main Reef Gold Mining Company. He is the author of "Present Day Metallurgical Engineering on the Rand," which was published in 1898.

The opening meeting of the Glasgow Technical College Scientific Society will be held to-morrow, when Mr. Henry Dyer will deliver a lecture upon "The Training and Work of Engineers in some of their Wider Aspects." The complete syllabus for the session is as follows: November 4th, "Electric Power Plant Design," by Mr. Phillip D. Ionides; November 18th, "The Commercial Efficiency of Prime Movers," by Mr. A. Marshall Downie; December 2nd, "Metallography," by Mr. James Muir; December 9th, fourteenth anniversary dinner; December 16th, "The Economy of Power Production—Relative Merits of Gas and Steam Engines for Various Purposes," by Mr. William D. Hamilton; January 20th, 1906, "Deep Mine Pumping," by Mr. John Hogg; January 27th, "Cylinder Ratios," by Mr. James Andrews; February 3rd, "Notes on Tool-Room Organisation and Practice," by Mr. George Blair; February 17th, "The Inglis Patent Boiler," by Mr. Gardiner Inglis; March 3rd, "Portable Electric Tools and their Application to Industrial Purposes," by Mr. Andrew Stewart; March 17th, "Metals Used for Bearings of Shafting and Lubrication of Same," by Mr. James Murdoch; March 31st, annual general meeting.

PAGE'S WEEKLY

An Illustrated Technical Weekly, dealing with the Engineering, Electrical, Mining, Iron and Steel, and Shipbuilding Industries.

DAVIDGE PAGE, Editor.

Clun House, Surrey Street, Strand, London, W.C.

Telephone No. [illegible] GERRARD

Telegraphic [illegible] Cable Address: "SINEWY, LONDON"

Editorial.—*All communications intended for publication should be written on one side of the paper only, and addressed to "The Editor."*

Any contributions offered, as likely to interest either home or foreign readers, dealing with the industries covered by the Weekly, should be accompanied by stamped and addressed envelope for the return of the MSS. if rejected. When payment is desired this fact should be stated, and the full name and address of the writer should appear on the MSS.

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Foreign and Colonial Subscribers receiving incomplete copies through newsagents, are requested to communicate the fact to the Publisher together with the agent's name and address.

New Copy for Advertisements,

Alterations, &c., intended for insertion in the current week's issue must be delivered **not later than 4 p.m. on Monday.** If proofs are required the copy and blocks should reach us several days earlier.

NEWS ITEMS.

[illegible] by Messrs. [illegible] the National Physical Laboratory.

[illegible]

Yesterday the Prince and Princess of Wales started on their Indian tour, to complete the visit to the most important parts of the British Empire which was [illegible]

The Highways Committee of the London County Council have submitted a recommendation, which was adopted, that authority should be sought in the next Session of Parliament to construct several new tramway routes. The total length of the proposed new lines is about eight street miles, and the cost of construction and equipment for the underground conduit system of electrical traction is [illegible]14,[illegible].

At the first meeting of the reconstituted Advisory Committee of the Board of Trade on Commercial Intelligence, Lord Salisbury cordially thanked the members present for consenting to place their services at the disposal of the Board of Trade. He anticipated that the reconstituted committee, enlarged as it was by an increase in the number of members directly representing commercial interests, and by the additional representation of colonial interests, which had been arranged for, would be of great assistance to the Board of Trade and be able to render useful service in connection with the commercial interests of the country.

CONTENTS.

	PAGE		PAGE
Editorial Notes (*Illustrated*)	857	Further [illegible] Quick Change Gear Lathe. By **T. S. Bentley, A.M.I.M.E.** (*Illustrated*)	[illegible]
[illegible] Society Notes	[illegible]	The Petroleum Outlook at Baku	[illegible]
News Items	[illegible]	**The Iron and Steel Institute** Meeting (*Illustrated*)	[illegible]
A Graphic Calculator. By William [illegible] (*Illustrated*)	863	The Use of Fans	[illegible]
London's New Artery: The **Opening of Kingsway and** Aldwych (*Illustrated*)	[illegible]	Electrical Exhibition at Olympia (*Illustrated*)	[illegible]
Reinforced Concrete Groynes	873	**Electricity and Power Engineering.** By W. B. Esson **M.Inst.C.E., M.I.E.E.**	896
A New Hydraulic Yard Crane (*Illustrated*)	874	Shipbuilding Notes	[illegible]7
The Progress of the South African Mining Industry. By Ernest Williams, A.M.Inst.C.E., M.I.M.M.	[illegible]	Correspondence	[illegible]
The Extension of the Port of Antwerp	[illegible]	Contractors' News	[illegible]
Electrical Machinery Break-[illegible]	[illegible]	Share List	[illegible]
[illegible] Biography **Mr. Ernest Williams,** A.M.I[illegible] E., M.I.M.M.	[illegible]	Home Metal Market (*Chart*)	[illegible]
		Prices Current	905
		Selected Patents (*Illustrated*)	910
		New Publications	[illegible]
		New Catalogues	[illegible]

VIEW OF THE NEW DOCK TO BE OPENED TO-MORROW AT SOUTHAMPTON.

New Graving Dock at Southampton.

The above illustration shows the magnificent graving dock just completed at Southampton by the London and South-Western Railway Company. This dock, one of the largest in the world, is amply capacious for the biggest vessels afloat or building. Its principal dimensions are: length, from point of sill to dock head 875¾ ft.; length occupied by keel blocks, 839 ft.; width of entrance, 90 ft. width of dock at floor level, 90 ft.. width of dock at cope level, 125 ft.; depth of dock from cope to floor, 43 ft., depth of water over sill at high water of spring tides, 33 ft.; depth of water over sill at high water of neap tides 29½ ft.

Since they took possession of the dock property in 1892 the South-Western Railway Company have reclaimed an area of nearly 100 acres, formerly known as the "Mudlands," and the new dock, approached directly from the estuary of the river Test, stands upon the northerly portion of this land, in an exceedingly convenient situation. It is built almost

...remedy of Portland cement concrete ... cubic yards of which material has been used. The dock will hold 53,000 tons of water and can be emptied by two centrifugal pumps in 2½ hours. The entrance gates are covered by greenheart timber meeting faces, and 250 tons of steel is contained in each leaf. They are opened and closed by powerful direct-acting hydraulic rams, made by Armstrong, Whitworth and Co. Ltd., and the plant provided for graving purposes includes a travelling electric crane—one of the largest in existence—capable of lifting more than 50 tons at a radius of 87 ft. This enormous steel structure will be invaluable to ships to war, as well as to passenger steamers, for which Southampton has now made such excellent provision, including no fewer than six graving docks. The new dock will be opened by the Marquess of Winchester at noon to-morrow.

A Motor Omnibus Tour.

The London Motor Omnibus Company, Ltd., announce that a special "Vanguard" motor coach will be dispatched for a thirty days' tour to the South of France—Nice, Monte Carlo, and Mentone, *via* Rouen, Orleans, Mont-Elimar, Avignon, Orange, Marseilles, Hyères, and St. Raphael, returning *via* Grenoble, Dijon, and Paris. This is a new development of the motor business which will be watched with interest.

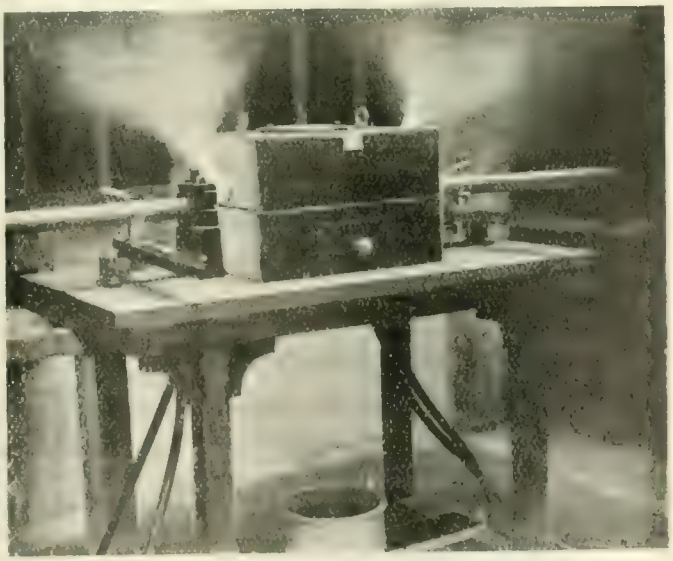
Mining Institute of Scotland.

A general meeting of the Institute was held on Saturday last at Kilmarnock. In the absence of the president, Mr. James Hamilton, Glasgow, was called to the chair. The following new members were thereafter elected: John Patersen, manager, Coylton, Ayr; R. Walker, coalmaster, Bo'ness; R. E. McCulloch, manager, Bo'ness; George Knox, mining lecturer, Wigan; Robert Currie, mining lecturer, Auchinleck; Dugald Dugald, engineer, Cambuslang; Joseph Chapman, Burnbank, Hamilton; James Bauld, undermanager, Annbank; and John F. K. Brown, mining student, Glasgow. A paper on "An Hydraulic Pumping Installation at Loanhead, was contributed by Mr. Robert Crawford. This Loanhead colliery, which is in the Midlothian coalfield, has been provided with an hydraulic pump, which delivers 300 gallons of water per minute against a head of 600 ft., through delivery pipes ... length of ... It was stated that the pump could be applied with satisfactory results to much greater heads than 600 ft.

September Trade.

The trade returns for the month of September reflect the improving condition of the iron, steel, and allied industries clearly enough, and, viewed generally, can only be considered satisfactory. The comparison is between months containing an equal number of working days, and no correction is therefore needed under this head. The imports are valued at £45,732,648, an increase of £2,658,642, equal to 6·1 per cent., and the exports are valued at £29,350,460, an increase of £3,421,801, equal to 13·2 per cent. To an amount of £2,992,709 this increase is due to articles wholly or mainly manufactured. The re-exports of foreign and colonial merchandise show an increase of £749,241, being valued at £5,521,237, this increase being equal to 15·7 per cent. The figures relating to the iron, steel, and allied industries under the head of imports and exports are summarised in the tables which appear on page 804, but it may be pointed out that in the unmanufactured class, iron ore and other metallic ores show higher values, and in articles wholly or mainly manufactured, while iron and steel are slightly lower in value, other metal manufactures are higher by £193,423, mainly due to larger receipts of tin. Machinery, on the contrary, is lower by £39,917.

On the export side in articles wholly or mainly



ELECTRIC FURNACE EXHIBITED AT OLYMPIA BY MARRYAT AND PLACE.

manufactured [illegible] show an increase of 41,470 tons in quantity, and £408,834 in value, this increase being mainly due to [illegible] shipments of iron pig, galvanised sheets, and ship and boiler plates. Other metal manufactures are up £44,730, to which increased copper is the main contributor. The gain of £111,625 is of a fairly general character, the exceptions being electrical machinery and sewing machines. New ships are less in number but the tonnage is greater, and the value considerably higher, the increase being £944,042.

Submarine A4.

Sixteen men had a very narrow escape from death on Submarine A4 at Portsmouth on Monday. Owing to some defect [illegible] the vessel was submerged [illegible] at an angle of about [illegible] The men were taken off and the submarine towed up the harbour, but just outside the [illegible] Up to the time of writing no official details are forthcoming, but it is anticipated that the A4 [illegible] be raised.

The Nippon Yusen Kwaisha, according to the Anglo-Japanese Gazette, will shortly place orders with some of the Clyde shipbuilding firms for eight steamers.

The Roumanian Government are about to purchase 20 locomotives and a number of carriages. The locomotives are to be arranged for burning lignite.

EXPORTS (Value F.O.B.).

	NINE MONTHS ENDED 30TH SEPTEMBER.			Increase (+) or Decrease (−) in 1905 as compared with 1904.	Increase (+) or Decrease (−) in 1905 as compared with 1903.
	1903.	1904.	1905.		
II.—RAW MATERIALS AND ARTICLES MAINLY UNMANUFACTURED:					
A. Coal, Coke, and Patent Fuel	20,397,780	20,180,121	19,404,843	− 775,278	− 992,937
B. Iron Ore, Scrap Iron and Steel	364,981	368,777	359,545	− 9,232	− 5,436
C. Other Metallic Ores	101,479	97,716	89,603	− 8,113	− 11,876
D. Wood and Timber	38,870	45,312	57,387	+ 12,075	+ 18,517
III.—ARTICLES WHOLLY OR MAINLY MANUFACTURED:					
A. Iron and Steel and Manufactures thereof	23,042,561	20,747,530	23,256,759	+2,509,229	+ 214,198
B. Other Metals and Manufactures thereof	4,958,561	5,093,028	6,389,221	+1,296,193	+1,430,660
C. Cutlery, Hardware, Implements and Instruments	3,387,247	3,598,882	3,708,322	+ 109,440	+ 321,075
D. Telegraph Cables and Apparatus	1,572,563	627,522	1,158,945	+ 531,423	− 413,618
E. Machinery	14,492,871	15,512,847	16,883,904	+1,371,057	+2,391,033
F. Ships (new)	3,347,562	3,334,609	4,421,533	+1,086,924	+1,073,971
G. Manufactures of Wood and Timber (including Furniture)	1,119,911	929,339	868,326	− 61,013	− 251,585

IMPORTS (Value C.I.F.).

II.—RAW MATERIALS AND ARTICLES MAINLY UNMANUFACTURED:					
A. Coal, Coke, and Patent Fuel	2,568	2,227	27,340	+ 25,113	+ 24,772
B. Iron Ore, Scrap Iron and Steel	3,852,733	3,502,667	4,100,555	+ 597,888	+ 247,822
C. Other Metallic Ores	4,533,035	5,058,409	5,677,732	+ 619,323	+1,144,697
D. Wood and Timber	19,919,175	18,256,364	17,268,966	− 987,398	−2,650,209
III.—ARTICLES WHOLLY OR MAINLY MANUFACTURED:	6,249,766	6,205,038	6,033,260	− 171,778	− 216,506
A. Iron and Steel and Manufactures thereof	13,866,559	15,336,813	15,718,872	+ 382,059	+1,852,313
B. Other Metals and Manufactures thereof	3,145,155	2,759,699	2,533,483	− 226,216	− 611,672
C. Cutlery, Hardware, Implements and Instruments	44,780	33,036	39,610	+ 6,574	− 5,170
D. Telegraph Cables and Apparatus	3,466,125	3,316,730	3,469,453	+ 152,723	+ 3,328
E. Machinery	43,704	18,069	15,681	− 2,388	− 28,023
F. Ships (new)	1,768,738	1,591,137	1,458,064	− 133,073	− 310,674
G. Manufactures of Wood and Timber (including Furniture)					

A GRAPHIC CALCULATOR.

By William Crosley.

THE instrument described is the outcome of the existing most serious need for some abridgment of the calculations which have to be made in respect of the assay values at sampled points in mineral veins.

In making reports involving the summary of many hundreds of assay results, the immense amount of time consumed by the staff in multiplying inches by dwts., in checking the results, in making corrections, and in reducing the whole to a common basis of comparison, was found by the writer to be so great that he cast about for some ready means of solving more readily these simple, but tedious, multiplications and divisions. This need is experienced by most mining engineers. The logarithmic slide rules already in use are open to serious objections. Even in the hands of operators accustomed to their use there is the tendency to find occasionally that the result is off the rule at one end, and the slide has to be shifted the other way, with a corresponding alteration of the decimal point. There is also the necessity for three movements to resolve $\frac{a \times b}{c}$.

THE APPLICATION OF GRAPHIC MATHEMATICS.

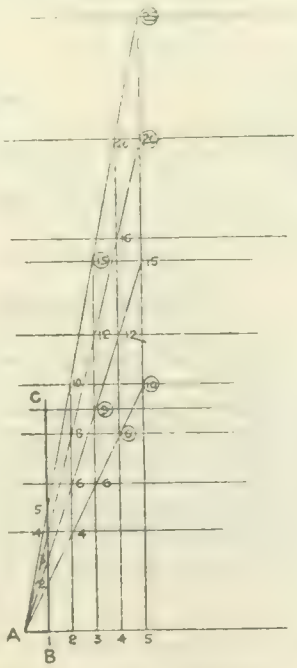
It seemed, therefore, desirable to find some application of graphic mathematics that would allow of all possible combinations (within certain reasonable and accustomed limits) to lie at once before the eye on one field awaiting only some defining line to select the combination to fit the case.

The very first rule to be found in graphic statics provides a basis of operations, and is in effect as follows —

Assume or draw a short line of any length as *A B* (fig. 1) and call it unity. Upon this at one end erect a perpendicular of indefinite length, say, at the right-hand extremity *B*. We will call this the unity vertical. Extend the unity base line also indefinitely beyond the unity point, and mark along the base line from *A* any number of points in terms of unity, and also mark upon the unity vertical any number of points in terms of unity. Erect perpendiculars on the first-named points, and draw through the latter radiating or divergent lines from *A*.

Each diagonal line cuts the perpendicular at a distance from the base line that is equal to the product of the number of the vertical by the number of the diagonal, such number being in terms of unity. We may represent these distances from the base line by parallel lines called lines of product. The products in the diagram are marked with circles.

Conversely, if we desire to divide any product by a given factor, we either seek the given factor on the unity vertical: produce a diagonal through this point till it cuts the product line, and from that point let fall a perpendicular to the base line, cutting the base line in the point representing the other factor (quotient), or we seek the factor on the base line, erect the perpendicular to cut the given product line and from that point draw diagonal to *A*; the point where this diagonal cuts unity vertical is the other factor (quotient). It will thus be seen that all results are either on or to the right hand of the unity vertical.



A B Unity Line.

B C Unity Vertical.

FIG. 1.

It will also be manifest that this process has very narrow limits of utility in consequence of the rapid opening of the angle formed by drawing diagonals through the factors on the unity vertical.

THE METHOD APPLIED.

For practical purposes, therefore, we are driven to use a fractional scale (fig. 2). By this means we bring all calculations to the unity vertical and the left-hand side of it, and confine operations within the field of the right-angled triangle whose other angles are 45 deg.

The unity line and the unity vertical line are now divided into any chosen (N) number of parts; for example, say ten on each, and we use these fractional numbers as if they were whole numbers.

From any factor selected in the unity vertical draw the diagonal line to A. Where this line cuts the vertical erected at the other factor is found the product of the two, but it is graphically $\frac{1}{N}$th of the scale (in this case $\frac{1}{10}$th) of the factors themselves, i.e., the line from 2 on the unity vertical crosses second vertical at $\frac{2}{10}$ of the space that exists between any two numbers on the vertical or horizontal scale. We read all products on a numeration ten times the apparent size, so that products are to be read by a scale N times smaller than the number into which unity is divided.

We are at liberty then to divide our triangle into a number of squares formed by two sets of lines parallel

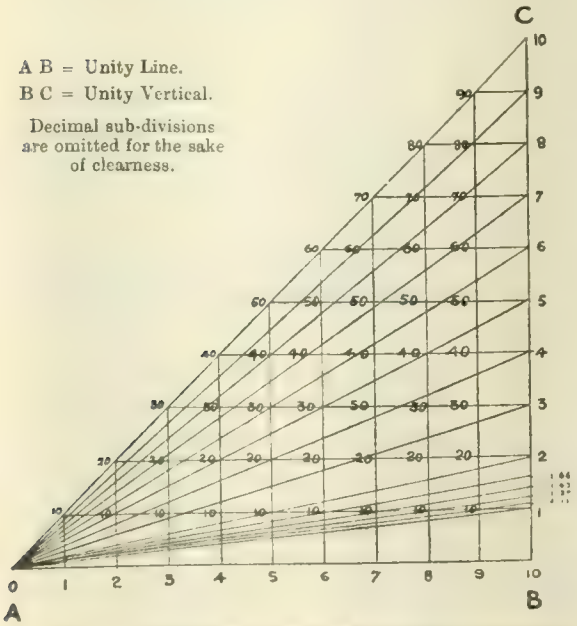


FIG. 2. FRACTIONAL SCALE USED FOR GRAPHIC CALCULATOR.

to the unity base and unity vertical, drawing lines from each number on the vertical to the point A. The product of each of such numbers with each of the others on the base can be read graphically on the corresponding vertical.

Thus the product of 2 on unity vertical and 5 on unity base is read at 10. Conversely, to divide 10 by 5 we find the point where 10 is cut by 5, the divisor, and follow the diagonal to the unity vertical and read 2 quotient; or to divide 10 by any factor we have only to find the intersection of the 10 line (as a line of products) with the vertical line of the divisor and draw a diagonal from A through this point to the unity vertical, and the quotient is read. Thus

[illegible] 1·25, [illegible] = 1·11, [illegible]

If, therefore, we wish to perform a series of calculations of any two factors multiplied together and divided by a constant we have only to divide our unity base and unity vertical into the number representing that constant and read our results at the intersection of the vertical and the diagonal; but at N times the value we should read for a product, i.e., that 10 as a product becomes 1 as a quotient, 20 becomes 2, and so on.

These principles have in the instruments under discussion been applied to computation of assay values either as a product of inches by dwt. or as

$$\frac{\text{inches by dwt.}}{\text{stoping width}}$$

It is a frequent custom to obtain first by means of the inch-dwt. product, a mean assay value and mean width for a given length of reef, and reduce this to a basis of uniform stoping width on the supposition that where the reef does not attain the stoping dimension so much waste rock must be allowed for as diluting the milling value in the stope. This is a safe custom even if a percentage of appreciation by sorting or picking be afterwards calculated on and attained in practice.

THE INSTRUMENT DESCRIBED.

In the instrument shown in fig. 3 unity is divided into 60 on both base and vertical, and subdivided into decimal parts. The base represents 60 in. numbered from left to right and the vertical represents 60 dwt.

Fig. 4 shows the "Cone" type of the instrument.

If stoping width is 60 in. the extreme right-hand vertical is used. It will be seen that the lines at 30, 36, 42, 48, and 54, are made stronger to catch the eye. Any of these (or, for the matter of that, any line) may be employed as the division or stoping width, and then unity is divided into that number and every-

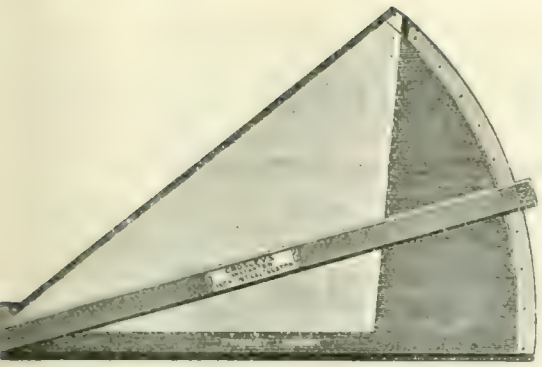


FIG. 3. IN THIS INSTRUMENT UNITY IS DIVIDED INTO 60.

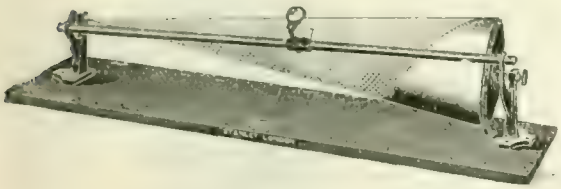


FIG. 4. CONE TYPE OF INSTRUMENT.

thing to the right-hand of the chosen unity vertical must be neglected.

Take as examples

Dwt.	In.	
17	25	
22½	19½	Stoping width 42
11½	27	

We bring the reading line (i.e., diagonal line) to 17 dwt. on the 42-in. line and run the eye back to where the reading line cuts 25 in., which it does at 10·1.

Similarly set at 22·5 dwt. on 42-in. line and read on the 19·5 in. line 10·4 dwt. as the result.

Again set at 11·5 on 42-in. line and read on the 27-in. line and 7·4 dwt.

A long list of assay values may be thus read off almost instantaneously with a minimum risk of error, and written down at once opposite the pairs of values or factors at their stoping value without further calculation.

From such a list a curve of practical value could be plotted. At present, usually only the average of a long list is reduced to a stoping width value, representing a mean value for that total length, but the fluctuations in value cannot be shown. With the calculator, however, the difficulty is removed, because the multiplication and division are performed at one operation and in less time than the multiplication alone by ordinary means.

his own use he had the product and the quotient marked at the same point, thus giving 1,500 in.-dwt. [illegible] of 6 dwt. by [illegible] dwt. and [illegible] of this product divided by 60. But this is not possible if the same diagram is to include several stoping widths to be used as unity bases, because the sub-division of unity varies accordingly.

It is thought that the reduction to a common [illegible] will be found much [illegible] and acceptable; but if the mere product of in. by dwt. is desired, charts may be obtained giving those [illegible]

The [illegible] uniform with it marked [illegible] upon the assay plans will give a much more correct and practical view of the value of a reef than if the in. and the dwt. be both given, or than if the in.-dwt. products are marked, which latter is at best a mental [illegible] used for the sake of [illegible] of a better.

Read before the Institution of Mining and Metallurgy.

THE LABOUR MARKET.

The returns just issued by the Board of Trade for September show that, as compared to a year ago, there was a notable improvement in the metal, engineering, shipbuilding, and textile industries. The following table illustrates the condition of labour in the iron and steel industry:—

	Number of Workpeople employed by firms making returns			Average Number of Shifts worked per man		
	In week ended Sept. 23rd, 1905.	Increase (+) or decrease (−) as compared with		In week ended Sept. 23rd, 1905.	Increase (+) or decrease (−) as compared with	
		A month ago.	A year ago		A month ago	A year ago
Departments.						
Open-Hearth Melting Furnaces	7,695	+ 200	+ 780	5·90	+ 0·03	...
Crucible Furnaces	562	+ 36	+ 132	5·55	− 0·06	+ 0·85
Bessemer Converters ...	2,001	+ 65	+ 63	5·11	− 0·15	− 0·05
Puddling Forges	9,649	− 121	− 109	4·99	+ 0·07	+ 0·16
Rolling Mills	29,877	+ 318	+ 2,022	5·29	− 0·01	+ 0·13
Forging and Pressing ..	3,699	+ 143	+ 299	5·54	− 0·07	+ 0·10
Founding	12,062	+ 136	+ 1,243	5·83	.	+ 0·04
Other Departments	8,447	+ 271	+ 873	5·83	+ 0·04	+ 0·13
Mechanics, Labourers .	17,132	+ 346	+ 1,549	5·85	+ 0·03	+ 0·08
Total ...	91,124	+ 1,394	+ 7,252	5·54	+ 0·02	+ 0·11
Districts.						
Northumberland & Durham	11,718	+ 43	+ 613	5·57	+ 0·04	+ 0·08
Cleveland	7,120	+ 212	+ 690	5·68	+ 0·22	+ 0·06
Sheffield and Rotherham ...	17,284	+ 493	+ 2,175	5·67	− 0·01	+ 0·19
Leeds, Hull and other Yorkshire Towns	4,431	+ 316	+ 483	5·63	+ 0·19	+ 0·19
Cumberland, Lancs & Ches	11,506	− 256	+ 362	5·38	+ 0·01	+ 0·24
Staffordshire	9,914	+ 125	+ 419	5·45	− 0·01	+ 0·08
Other Midland Counties	5,143	+ 56	+ 432	5·28	+ 0·06	+ 0·09
Wales and Monmouth ...	8,662	+ 119	+ 1,041	5·62	− 0·06	+ 0·02
England and Wales ..	75,778	+ 1,108	+ 6,215	5·55	+ 0·04	+ 0·13
Scotland	15,346	+ 286	+ 1,037	5·52	− 0·07	+ 0·61
Total	91,124	+ 1,394	+ 7,252	5·54	+ 0·02	+ 0·11

LONDON'S NEW ARTERY.

THE OPENING OF KINGSWAY AND ALDWYCH.

WE have from time to time called attention to the progress of the Kingsway and Aldwych, and we are now glad to be able to chronicle the opening of the new thoroughfare on Wednesday by His Majesty the King, who was accompanied by Her Majesty the Queen. The main features of the scheme will be within the recollection of our readers. The undermentioned particulars are from the admirable descriptive pamphlet issued by the London County Council.

GENERAL FEATURES.

This is the largest and most important improvement which has been carried out in London since the construction of Regent Street in 1820. It gives a connection between north and south London at that part of the west central district which needed it most, and it supplies a new thoroughfare which will make the development of this locality one of the finest features of modern London. Further than this, it solves the problem of connecting north and south London by means of the tramway system; for the carrying of the tramway lines beneath the road at those points where traffic is heaviest is the first attempt to deal with the traffic communication of London in a comprehensive and thorough manner. The new street, with its 60 ft. of roadway and its broad and handsome footways, each 20 ft. wide, running through a district already stamped as the home of business to a marked degree, where the banking, legal, insurance, shipping, and other businesses have long been located, and connecting two such commercial centres as the Strand and Holborn, must develop the commercial activity

PLAN OF THE HOLBORN TO STRAND IMPROVEMENT.
Showing the new thoroughfares and the various streets, etc., demolished or partly demolished.

of this portion of London. And the opportunity it affords for architectural effect will make it the standard for rebuilding in London for years to come.

The new street starts from the junction of Theobald's Road with Southampton Row, and proceeds southwards along the line of what was formerly the narrow thoroughfare named Southampton Row, then crossing Holborn it proceeds through what was formerly Little Queen Street, and then in a straight line to the site of the old Olympic Theatre which fronted Wych Street. At this point the street divides and forms a crescent, the eastern horn of which debouches into the Strand at St. Clement Danes Church, while the western horn enters the Strand at Wellington Street, almost opposite Waterloo Bridge. From Holborn to the junction with the new crescent road, the thoroughfare has been named by the Council Kingsway, and the crescent road has been named Aldwych, both names referring to the historical associations of the district.

The complete thoroughfare, including side streets, is about 4,200 ft. in length, or just over three-quarters of a mile, and the width 100 ft. throughout, with the exception of a short distance in Southampton Row, where it is 80 ft. The rateable value of the property taken for the improvement may be put, in round figures, at £100,000. This is very little short of the rateable value of whole provincial towns, such as Weymouth, Taunton, Macclesfield, and Stalybridge, and indicates the magnitude of the operations which the Council has had to conduct.

It is a significant fact that the Royal Commission on London traffic, which has so recently inquired into the means of locomotion and transport in London, has made as one of its

VIEW IN KINGSWAY DURING THE PROGRESS OF THE IMPROVEMENT.

KINGSWAY ON OCTOBER 5TH, 1905 (SHOWING ROOF OF SUBWAY NEAR COMPLETION).

principal recommendations the provision of wide streets penetrating through all parts of London. This street from Holborn to the Strand, although it was planned so long ago as the year 1898, and is now completed, entirely carries out the spirit of the recommendations of the Royal Commission.

The following is a description by Mr. Maurice Fitzmaurice, C.M.G., the Council's chief engineer, of the engineering points of interest in connection with the street and tramway subway.

THE SUBWAY.

The greater portion of the tramway subway is close to the surface of the street, but in the short length of less than a mile, between Theobald's Road and the Strand, there are several kinds of construction. The rails are on the surface in Theobald's Road, then they descend to below the surface in Southampton Row by a cutting in the centre of the street. The two lines are then carried in deep level cast-iron tubes under Holborn, and then rise to close to the surface at the station in Kingsway, a little to the north of Great Queen's Street. From this point to the station situated at the junction of Kingsway and Aldwych, the subway is close to the surface of the street; in fact, the depth from the surface of the street to the top of the subway is only about 3 ft. After turning under the western arm of Aldwych, the subway falls very quickly again, so as to pass under the Strand in cast-iron tubes at a deep level. After passing under the Strand it continues along Wellington Street, the rails being 33 ft. below the surface, and finally emerges on the Embankment at road level. The varying levels at which the subway is built show the difference in construction necessary when going along a new street specially constructed, in comparison with crossing existing thoroughfares. It was necessary to dip the rails to a depth of 31 ft. below the surface of the roadway in Holborn, to avoid existing sewers and othe

obstructions. At the Strand crossing, the rails have to be kept 34 ft. below the surface for similar reasons. Under Kingsway no obstructions have to be dealt with as the sewers are in duplicate, one on each side of the street; and the pipe subways also on both sides, take all gas and water pipes, electric cables, etc.

No inconvenience is caused to the public by dipping under Holborn and the Strand, as the stations are fixed at points where the subways are close to the surface. At both Great Queen Street and the junction of Kingsway and Aldwych, the platform is only 16 ft. below the street level, so that is it not necessary to provide lifts. The tramcars will run at short intervals, and as the passengers will be continually entering and leaving by the short flights of stairs there will be no crowd on the platform. It will never be necessary to break up the surface of Kingsway for the purpose of laying pipes, as ample room is provided in the pipe subways at both sides, and in fact the small depth from the surface of the road to the top of the subway will not permit of any pipes being laid in the roadway. At a considerable depth below the tramway subway, the Great Northern and Piccadilly Railway is being built. This is an ordinary tube railway, which will eventually be carried under the Thames to Waterloo Station. There are therefore lines of traffic at three different levels in the new street—the ordinary traffic on the surface, the tramway traffic a short distance below the roadway, and a tube railway at a still deeper level.

PRECAUTIONS AGAINST DAMAGE.

In constructing the subway between Great Queen Street and Southampton Row, very special precautions were taken so as not to damage fine property, such as the Holborn Restaurant and other buildings along the street, and it is satisfactory to know that the precautions taken were quite successful. It was also

THE SUBWAY.

necessary to carry out the work with great care, so as not to damage the large sewer running along Holborn, which is quite close to the top of the tunnel.

LINKING UP THE TRAMS.

The Council has since made application to Parliament for power to construct a tramway from the southern portion of the subway along the Embankment and across Westminster Bridge, so as to effect a junction of the north and south tramway systems, but up to the present time Parliament has not granted the Council these powers.

SOME OTHER IMPROVEMENTS.

It may be of interest to compare the widths of other large street improvements which have been carried out, with that of the Holborn to Strand scheme.

The width of Shaftesbury Avenue, completed January, 1886, and Charing Cross Road, completed February, 1887, is 60 ft.; that of Queen Victoria Street, completed November, 1871, 70 ft.; that of Northumberland Avenue, completed March, 1876, 90 ft.; that of Rosebery Avenue, completed July, 1892, 60 ft.; that of the Tower Bridge Road, opened March, 1902, 60 ft.

GRADIENTS, PAVING, ETC.

The width of both Kingsway and Aldwych as already stated, is 100 ft., the roadway being 60 ft. wide and each of the footpaths 20 ft. The roadway in Kingsway for its whole length is nearly level, the greatest gradient being only 1 in 105.

The gradients in Aldwych are 1 in 50, and 1 in 55, on the east and west branches respectively.

The paving of the carriageways, where in the City of Westminster, is of wood; and where in the Borough of Holborn, of asphalte.

In connection with paving and other works a subway for pipes and wires has been constructed under each side of the carriageway of the new streets, and sewers have been laid under the subways. Arrangements have been made for the planting of trees on each footway and for the lighting of the thoroughfare with incandescent gas. The width of the subways is 12 ft. and the height 7 ft. 6 in.

STATISTICAL ASPECT.

It may be interesting to quote the following figures in connection with the improvement :—

Length of Kingsway	1,800 ft.
Length of Aldwych	1,500 ft.
Total length of the new thoroughfares (including Southampton Row and side streets)	4,200ft. or just over three-quarters of a mile.
Width of Kingsway and Aldwych	100 ft.
Number of properties acquired and demolished	about 600.
Number of freehold, leasehold, and other interests involved	1,500.
Area of land available for new buildings	14 acres.
Material excavated in forming the new road and subways	300,000 cubic yards
Total area of paving	70,000 square yards
Average number of workmen engaged daily upon the work	250
Amount of concrete used	83,000 cubic yards
Number of bricks used	6,300,000.
Number of wood blocks employed for the paving	1,600,000.
Area of asphalte paving	8,000 square yards
Area of York stone paving	20,000 square yards
Quantity of granite used	1,500 tons.
Quantity of cement used	15,000 tons.
Quantity of ballast used	90,000 tons.
Quantity of steelwork used	2,000 tons.
Quantity of cast-iron used	1,300 tons
Total area of property dealt with	about 28 acres.
Area of land dedicated to public in form of new streets	about 12½ acres.
Area of surplus land already dealt with	about 5¾ acres.
Further area of surplus lands available for building sites	about 10½ acres.

THE CHIEF ENGINEER.

The works carried out in the Strand were commenced under Sir Alexander Binnie, the late chief engineer of the Council, and shortly after their commencement were taken over by Mr. Maurice Fitzmaurice, C.M.G., the present chief engineer. The works in Aldwych and Kingsway, including the tramway subway, were designed and carried out by Mr. Fitzmaurice. All the works were executed by the Council's Works Department, under the management of Mr. G. W. Humphreys, the Council's manager of works.

REINFORCED CONCRETE GROYNES.

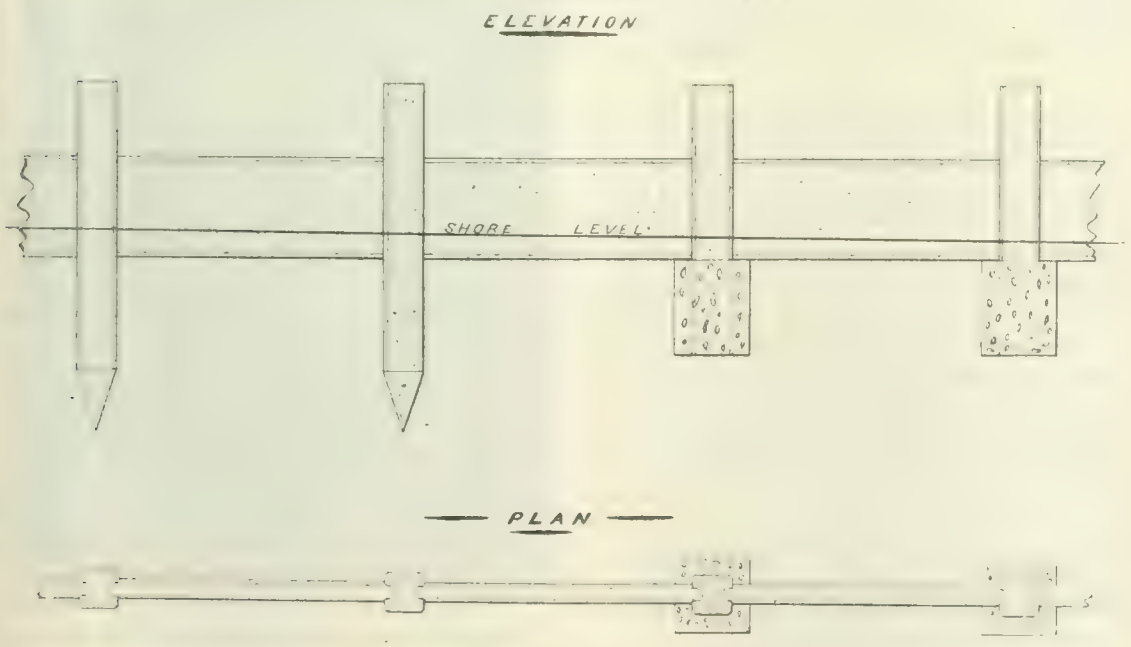
The subject of coast erosion and foreshore protection is one which periodically forces itself upon the public attention, and at such times we hear of valuable land devoured by the sea, which can never be regained. Consequently any attempt that is made to grapple with the problem is worthy of very serious consideration, and the latest method suggested for the purpose also provides an intersting use for reinforced concrete. The Owens-Case groyne which is illustrated herewith consists of piles of I section, made of reinforced concrete, driven or otherwise fixed in the foreshore at suitable intervals apart. Slabs of reinforced concrete are fitted in the spaces between the piles, and slide between them in the grooves as shown.

The piles can be set in concrete, or driven with a pile-driver or water jet, the use of these alternative methods depending upon the nature of the shore.

Some of the advantages of this type of groyne are : (1) the additional weight of the reinforced concrete planking over wood planking makes the former less liable to displacement, and, in addition, it is self-adjusting to under-runs, the slabs sliding down by their own weight : (2) great durability, the reinforced concrete, not being liable to attack by the ship-worm, etc., and not easily worn away by the attrition of pebbles ; it is also proof against decay ; (3) the groynes can be easily and quickly constructed, and are suitable for use both above and below low-water mark ; (4) they can be easily raised as accumulation takes place.

The planking and piles are moulded on shore in such sizes as to permit of their being easily handled, and consequently the groynes can be rapidly constructed.

The cost of these groynes compares very favourably with the cost of substantial wooden groynes, and, moreover, wherever suitable shingle exists on the foreshore it can be used in the construction, thus largely reducing the cost. For the above details we are indebted to Messrs. Owens and Case, 15, Tothill Street, S.W.



THE OWENS-CASE REINFORCED CONCRETE GROYNE.

A NEW HYDRAULIC YARD CRANE.

BY MESSRS. RICE AND CO., LTD., LEEDS.

THE accompanying illustration shows a large hydraulic yard crane of the self-contained type. It is capable of lifting a load of three tons through a height of 15 ft. 6 in., and has a maximum radius of 40 ft., with a clear head room under the jib of 17 ft. 6 in. The square pillar which supports the crane post is 17 ft. high, and consists of a massive cast-iron base, well stiffened with ribs; from each corner an angle iron upright is carried to the top casting to which it is securely bolted, and the whole is then plated with mild steel plates. The base plate has a central boss which is bored to receive the bottom gudgeon pin of the crane post, and the top casting of the pillar is bored out to form a bearing for the upper part of the post. The load is racked along the crane jib by hydraulic rams, and the slewing is also by hydraulic rams placed inside the pillar and arranged to swing the crane through a complete circle.

The working valves are conveniently placed in a cabin mounted on the jib where the operator can obtain a good view, and have complete control of the work. Special provision is made in the valves for working the crane at a graduated speed from very slow up to its maximum. A wrought-iron balance box of large capacity is fitted at the back, so that stones, or, rough cheap material can be used for counterweight. Special attention has been given to the proportions of the base plate, and foundation, as well as the lateral stiffness of the crane so as to ensure stability to the structure.

The entire crane, the total height of which is 29 ft. 6 in. was erected by the makers in their erecting shop under their eighteen-ton overhead traveller and tested to its full load capacity, before leaving their works, with entirely satisfactory results.

The complete crane reflects much credit on the makers, owing to its general design and proportions which give a pleasing effect to the whole structure.

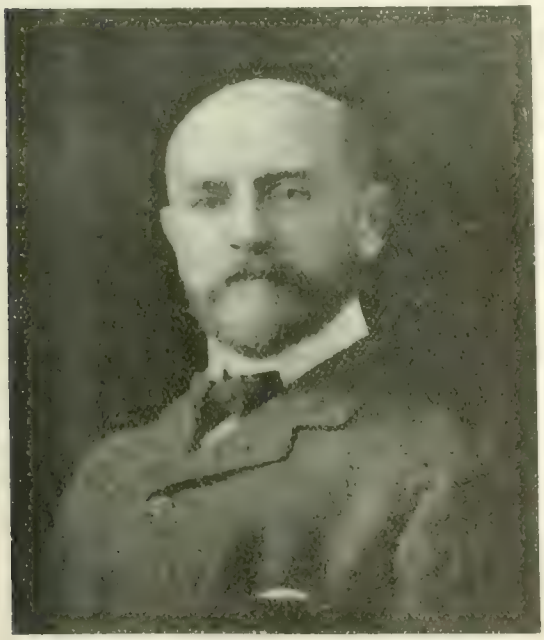
THE PROGRESS OF THE SOUTH AFRICAN MINING INDUSTRY.

From an Address to the Members of the South African Association of Engineers by Mr. Ernest Williams, A.M.Inst.C.E., M.Inst.M.M.

THE address, which was delivered by Mr. Ernest Williams, the president for 1894-5, to the members of the South African Association of Engineers, reflected in a thoughtful way many salient features of the mining industry in South Africa. He showed what in his opinion ought to be done to improve the prospects of the industry, particularly in regard to the deep levels, and a prominent member, Mr. G. S. Burt Andrews, subsequently expressed the opinion that if the Government and mining houses would carry out some of the suggestions made there would be very few unemployed in the Transvaal. An abstract of the address follows :—

KEENNESS FOR EFFICIENCY IN THE MINING INDUSTRY

We no longer speak of stamp mills having 100 heads as the unit of equipment, as this is to be increased about ten times; the tonnage duty of the stamps will be almost doubled by the introduction of [illegible] reducers, principally of the tube-mill type, and the recovery of the value is to be increased by about 10 per cent. Never before in the history of this goldfield has the same keenness for efficiency and permanency been in evidence; standardisation of work, simplification of method, multiplication of units and centralisation of effort and control have been developed; it may be, beyond what we are quite ready for, and although I do not propose to cry a halt in the chase after magnitude, so as to give us breathing time, I would mention one or two points which seem to me to be worthy of consideration.



ERNEST WILLIAMS, A.M.INST.C.E., M.INST.M.M.
President 1904-5 South African Association of Engineers.

We must keep in view the necessity for economy in equipping as well as in the running of our undertakings, every pound spent in excess of the actual necessary expenditure is so much money lost—it may be wasted—and it is here that good engineering judgment is best displayed. Our present system of work tends to specialising to a degree not serving in the best manner the greater interests of the country; we are in danger of raising a generation of engineers who can only equip on a magnificent basis, and we must guard against our successors saying of our work: "It was magnificent but it was not true mining economics."

We are rapidly deliminating the area within which the payable banket beds occur in the Transvaal, and we are seeking for the reappearance in the Orange River Colony of the payable banket beds outcropping along the Rand.

Since the discovery of the main reef series and the realisation of the gold values of these beds very many people have said we must revise our ideas as to the occurrence of gold, and such people would pass by the claims of the old and tried gold-carrying rocks of the world that for generations produced the most gold; but as careful engineers we must not allow the glamour of the new to deaden our hopes in the old, and in the Transvaal to-day the primary rocks or schists are being surely though slowly recognised as worthy of confidence, for they are proving to us their value as substantial gold carriers. At points far apart in the Transvaal, satisfactory gold values have been found in the primary or schistose rocks, and as prospecting is carried on, further gold deposits will certainly be found

in these rocks and this class of proposition will, I think, no longer be flouted by the financier, who is growing very specialised and wants the engineer's report setting forth in minute detail the value of any property he is asked to finance.

The mining propositions I have in mind, occurring in the schists, will, I believe, restore some of the romance of gold mining, and remove the present monotonous conditions surrounding the production of gold within the Rand area, which conditions are rapidly partaking of the routine obtaining in the production of pig iron. At our meetings we have had contributions from members dealing with this question of the probable gold-bearing value of the old crystal linerocks of the Transvaal, and the information given shows the advisability of paying more attention to these deposits.

Some good mining propositions in the schistose rocks have been exploited in the healthy districts of this Colony, and the development of these in the so-called fever districts is progressing, but prospecting is difficult in some cases owing to the prevalence of malaria during the rainy season. I have recently visited some of the mines in the so-called fever districts, and am quite satisfied that one of the most important matters controlling the occurrence of malaria there is the almost utter disregard of all sanitary precautions. Most of us know something of the history of many of the gold mines in the north-eastern and eastern districts of the Transvaal, how the occurrence of gold deposits running a high value per ton was announced with great noise, and sometimes the company formed to work the mine ended in much more noise, after a career something like that of a rocket, going up like a comet and coming down like a stick. I make bold to assert that in many cases the ending of the life of such mines was not due to lack of payable gold value but to lack of efficiency in other factors, chiefly—humanly controllable—at times through attempting to attain the magnificent on the surface before proving the actual value lying in the ground. Then came the old story "No further money available for development," and then the end. It may be out of place to mention that the Klein Letaba goldfield, with an area of hundreds of square miles, offers a splendid field for the prospector who understands his calling, as very good gold values have been proved, but so far, the superior attractions of banket have depreciated the real value of such lines of country. It may be interesting to remark that, in the Klein Letaba goldfields, a new class of gold-bearing deposit has recently been proved. Here the occurrence of gold thus, in the character of rock, is a new mineralogical feature. We have gneissoid and stratified rocks with an inter-bedded sheet of pyroxene rock, laid down under water, the whole strata subjected to lateral pressure, under which the rocks folded at points of greatest stress, when the elasticity of the sedimentary rocks, and of the lower and upper margins of the eruptive rocks allowed these rocks to yield to this pressure, the central portion of the pyroxene sheet being crushed or fractured, and thus forming a somewhat permeable mass, through which chemical solutions circulated, altering its character. These solutions, which were auriferous, circulated freely throughout the mass, and deposited crystalline gold in the place of elements chemically set free by the action of such solutions.

PRIZES IN THE OLD SCHISTS AWAITING LOCATION.

We must not forget the advantages likely to accrue to those who prospect and search for gold values in the schists of the Transvaal; we must keep in view the fact that the area of payable banket, though extensive, is limited, and that we are rapidly defining its limits, but we have the schists, not only of the Transvaal, but of every State in South Africa to prospect, prove, and probably to find carrying a high metalliferous value, and I confidently anticipate that when the Rand has passed its zenith—may it be long before that time comes—the proved position of Southern Africa will be maintained by the wealth got from its schistose and granitic rocks. In the past the schistose rocks of the Transvaal have done well in gold production. We have had Eersteling, Pilgrims Rest, Mac-Mac, and Barberton. Then in Rhodesia and Portuguese East Africa the same rocks have been exploited, and many are the prizes in the old schists awaiting location.

GOLD IN CAPE COLONY.

It is not generally known that gold, associated with tellurium, has been found in the Cape Colony, but I have it on reliable authority that this is a fact.

THE DIAMOND INDUSTRY.

The progress of the Transvaal diamond industry has been quite phenomenal, although diamond production is practically confined to one mine; and this State has benefited therefrom to an extent (and I want you to mark it clearly), to an extent not possible in any other branch of mining. The diamond mines of the Cape Colony continue to hold the premier position, and great extensions in operations are being carried out. In the Orange River Colony, diamond mining constitutes its chief mining industry.

THE FUEL FACTOR.

Coal production has made considerable progress, and to-day the Transvaal, Natal, Orange River Colony, Cape Colony and Rhodesia produce coal of good

quality at a price suiting the customer. In the Transvaal the average pit's mouth price is between 6s. and 7s. per ton, leaving only a small margin of profit to the producer, but enabling the gold mines to work at a considerable profit. Now, fuel being such a necessary factor in the progress of any industry, it is satisfactory to know that our available supply is very great, and has been providentially distributed over Southern Africa, large areas of the Cape Colony, Orange River Colony, the Transvaal and Natal and Rhodesia being coal bearing. But it is safe to say that, but for the Rand's premier industry, the value of the coal seams in South Africa would have been very low for ages to come.

To meet the demand for fuel, the Transvaal coal areas have been most largely drawn upon, the output of coal increasing with that of gold, and in nearly all the collieries European methods prevail, and most up-to-date equipments have been laid down. In connection with the coal trade I may mention that the Government of the Transvaal considered it in the best interests of this Colony to purchase a portion of its railway requirements from a neighbouring Colony at a time when most of the Transvaal collieries were working far below their capacity, and were offering their coal at a very small margin of profit; the State thereby incurring a loss in the general revenue, which loss I believe more than balances the extra cost of transporting Transvaal coal over Transvaal lines for Transvaal uses. Few Colonial Governments would do this; it may be business but it seems a poor policy, and the progress of a State is not advanced in this way.

TRANSVAAL TIN.

A very gratifying feature of the year has been the immense interest taken in the tin-bearing districts of the Transvaal, as optimists and pessimists alike expect that great results will follow the work now being done on these tin fields. The Bushveld tin area is rapidly being developed and extensively exploited. The work on the Swaziland tin area is also progressing, more slowly, but none the less surely. I would like to place on record the important fact that the discovery of tin in the Bushveld area was mainly due to the opinion of scientific men, not primarily to the hardy prospector.

AN INSTANCE IN WHICH THE TECHNICALLY TRAINED MAN SCORED.

After the first rush in Barberton, an American named Dr. Painter, in 1899, trekked from Barberton to Pretoria, and after travelling through the Bushveld area expressed the opinion that it would one day be proved to be tin bearing. Professor Molengraaf, who was State Geologist under the late Republic, predicted that the Bushveld area would be proved a highly metalliferous area, and I believe that Mr. Austin and Mr. de Jager, after hearing Professor Molengraaf's opinion, set about re-prospecting the Bushveld district, with the results we all know.

It will be remembered that Sir Roderick Murchison, many years ago, predicted, after he had had a description of the Australian continent sent to him that Australia would become a very important gold-bearing area. He based that opinion upon his knowledge that the Australian continent is probably the oldest bit of earth in existence, so that Sir Roderick Murchison scientifically thought that Austrialia would produce immense goldfields.

I wish to emphasise the fact that it is not always the rule of thumb man who gets home. There is still some merit in the opinion of a scientific man, there is still a chance that the technical, trained man may be right. We certainly look forward to seeing the Transvaal a tin producer of no mean order in the near future. In addition to the tin fields of the Transvaal the tin fields of the Cape Colony have attracted some attention, and many people are sanguine about the prospects of that Colony as a tin producer.

OTHER METALS LOCATED.

You all know that discoveries of copper ore have recently been made in the Transvaal and Natal, but Cape Colony still maintains its position as the premier copper producer in Southern Africa. I have been informed that in Rhodesia quite lately cupriferous cement or conglomerate has been discovered, and that very great things are expected of it. So it is possible that we may see Rhodesia a large copper-producing territory. The deposits of lead ores in this Colony and Southern Africa have not attracted much attention as the low price of lead, coupled with the small silver value in the lead produced from South African ores, does not attract the financier.

So far as I know, none of the other metalliferous deposits in Southern Africa have attracted attention lately, though doubtless payable deposits do exist and will be discovered with proper prospecting.

THE FUTURE OF THE SOUTH AFRICAN GOLD MINING INDUSTRY.

Probably we all indulge in a little speculation—I do not mean on the market—a little speculation as to the future of gold mining in South Africa, for upon this more than upon any other individual point rests our progress. You need not be reminded that waves of prosperity have followed new mining discoveries. We know the wave of prosperity that was enjoyed at the Cape after the discovery of Kimberley diamond mines,

and we also know that it was a professional man who, against the expressed opinion of the ordinary layman, said the first diamond found on the Vaal River was really a diamond; I refer to the late Dr. Atherstone. The waves of prosperity following the gold discoveries have occurred time after time, and when the mining industry of South Africa languishes the whole of South Africa suffers. Naturally, being largely interested in mining, we cannot help speculating as to the future, and in such a mood we think most of that which is nearest to our interests; in a word, we become parochial, and this is not altogether a fault if it brings us to a deeper consideration of the needs of our surroundings.

THE GOLD LAWS.

I do not wish to encourage any feeling of parochialism, but would advert to our present position in the Transvaal under the Gold Laws now existing. The first Gold Law of the Transvaal was instituted under the Republican Government, and there are very few who can find substantial fault with those old laws. Originally the freeholder of land in the Transvaal enjoyed to the full all mineral rights. In the eighties the Republican State assumed the ownership of gold found within its borders—I mean the unmined gold—making due provision for the same being worked, as the then Government considered, upon an equitable basis. For many years the law worked very satisfactorily, and I think that under it there was less litigation than is usual over the ownership and working of minerals in mining countries generally. Land-owners were dealt with in a very liberal spirit, and the man in the street was encouraged in his efforts to obtain gold-bearing ground. We, however, are more concerned with what the revised law will be like, and it seems strange—I should like to emphasise this point—that neither our Association nor our kindred Associations in this Colony have been consulted by our Government, or asked to give their advice as to what provisions should be inserted in the revised law, though many of our members have had experience of the operation of laws regulating the mining of the noble metal in other countries and states and could I believe render some assistance in the matter.

We have had various suggestions put forward by many amateurs as to the way in which the law should be amended, but it seems to me that the only real difficulties in the working of the present law are, first, the determination of the land owner's share of any proclaimed area, and, secondly, the difficulty there will be in controlling pegging on proclaimed areas such as the deeper deeps, and on proved extensions of the Rand.

I consider the State is inclined to under-estimate the land-owner's legitimate rights, especially if the land-owner is prepared to develop his property. The land-owner should be encouraged, and not discouraged. Part of such encouragement should be the apportionment to him of the gold rights over a considerable portion, and in cases of very deep ground, the major portion of his own property, and such portion should bear some relation to the expenditure likely to be incurred in the development and also in the preliminary proving of the value of the ground. When the land-owner's rights over any farm have been settled, the balance should be dealt with in the best interests of the State, and one of the matters making for the best interests of the State is to have any such proportion proved, developed, and worked as early as possible.

We know that on the Rand there is very little gold-bearing ground open for pegging, and the chief extensions we expect are on the line of the deeper deeps and to the east and west, where a considerable area of ground should shortly be at the disposal of the Government, and over the disposal of the area outside the mynpachts on these farms, there is likely to be considerable diversity of opinion. It is not possible to allow open pegging, but if it were not unsafe to take that course I would ask what will be the use of that deep ground to the ordinary man? It will be well nigh impossible to get a number of owners of small areas to agree to a working plan, and the ground would be locked up indefinitely. The locking up would be to the decided disadvantage of the State and a solution must be found under which any proved ground shall as soon as possible be handled in such a way that the State may benefit without undue delay.

SUGGESTED 2½ PER CENT. GOVERNMENT GUARANTEE.

The suggestion to let out the areas on tribute is, I think, unsuitable, as there would be everlasting trouble with the tributors unless the tributors in each case proved to be of quite a different character to those everywhere else, and many of us have had considerable experience with tributors under very varying conditions. They are never satisfied and no agreement that you can make with them do they consider final. Now, I say, that the only satisfactory way is to dispose of the unallotted gold rights on the deep deeps out-and-out. As we all know, it is not easy to raise money for developing and equipping a mine, where the work has to be commenced at thousands of feet above the nearest point of value, and the first return on the money spent may be long in coming. People do not see why they should put their money into properties and be six or seven years before they

obtaining here; few people indeed are disposed to put their money into deep level properties unless the full amount of cash required for development be in [illegible] of the deep deep ground already owned by companies or individuals, or ground to be acquired by the land-owners under the proposed revised Gold Law, the State should render assistance after the ground has been proved by boring. It should guarantee to the owners of the property say 2½ per cent. on the actual cost of sinking to the reef, and on the necessary preliminary development, such interest as may be [illegible] of the Government Mining Engineer's Certificate that the money has been properly spent. When a company reaches the producing stage, it would repay to the Government in instalments, of course, the 2½ per cent. so guaranteed and paid. I take it, any company starting to exploit a deep level proposition, pays to the Government directly or indirectly much more than 2½ per cent. of its total capital outlay on the shaft-sinking; therefore the State will be receiving directly or indirectly more than its guarantee. The balance of ground outside the mynpachts should be sold under some definite conditions as to working, and payment for same might be upon a deferred payment basis, which would encourage the taking up and the development of the deep deep ground. I throw out this suggestion because we at the present time would like to see these deep levels go ahead, but money does not seem to be forthcoming for them, and a 2½ per cent. guarantee by the Government would bring the money forward, and the Government would have all the work [illegible]

A HINT FOR THE GOVERNMENT.

Perhaps people will say that this is outside the province of any Government, but I would refer you to the Government of Western Australia, and ask you to read up the laws of that Colony, particularly Act No. 20, which I think was assented to on December, 11th, 1902, and in that you will see that instead of retarding the development of the Colony everything is done to accelerate it.

We hear a great deal about the prospecting necessary in this Colony, and it seems to me that we could usefully adopt the Australian system of issuing "miners' rights." Anyone who wishes to prospect in any Colony must go to the warden—or official who has the powers [illegible] mining registrar [illegible] and obtain from him a licence for which he pays 10s. a year, and with that licence he is able to go over the whole of the Government proclaimed ground and take possession of a claim. I think we could adopt with advantage several of the West Australian Laws, and hope that one day our members who have had wide experience in other countries may be invited to assist the Government in the revision of laws relating to ownership or working of the gold-bearing areas of the Colony. The Government should do all possible to encourage the pioneer and not endeavour to take from him every possible penny for the right to develop the resources of the Colony.

THE EXTENSION OF THE PORT OF ANTWERP.

THE following figures show the result of the improvements which the complete realisation of the extension [illegible] Antwerp [illegible] road in our last issue.

[illegible] will on the new cutting of the Scheldt and that bordering the left bank of the canal dock will be respectively 5½ miles and about 4 miles in length. Adjoining these quay walls there will be an open space from 102 to 218 yards in width, furnished with sheds of a superficies of about 163 acres on one side and of 122 acres on the other side. Between the quays of the river and those of the canal dock there will be an open space measuring 272 acres. The canal dock will be 273½ yards broad and 489 acres in extent, including three widened turning spaces 437½ yards across. The new docks of a total area of 477 acres, will be lined with 15 miles of quay walls and with 425 acres of sheds.

The capacity of the dock formed by the disused arm of the river will be 1,457 acres.

The length of the quay walls on the Scheldt will be increased from 3 miles 734 yards to about 7 miles, and the length of the quays of the docks will be increased from about 9 miles to more than 26 miles.

IMPROVING THE TIDAL WATERS.

The Belgian Government are of opinion that, after a certain amount of necessary dredging has been carried out upstream, the works proposed to be effected on the Scheldt below Antwerp will improve the tidal waters and the navigable conditions of the river, probably without appreciable prejudice to the security of the land situated above the city; but, in any case, the action of the tides will be the object of the most careful observations, and the dykes will, if necessary, be strengthened and raised.

ELECTRICAL MACHINERY BREAKDOWNS.

IN the last issue of PAGE'S WEEKLY, we dealt at some length with breakdowns occurring in steam and gas engines, reviewing the facts as they are presented by the report of the chief engineer of the British Engine and Electrical Insurance Company. Perhaps that portion of the report which deals with breakdowns in electrical machinery is of even greater interest, in view of the rapid increase in the number of users of electrical machinery, and the growing use of electricity for power purposes.

The rate of increase may be gauged by the fact that the number of dynamos and motors insured at the end of 1904, exceeded the number insured at the end of 1903 by 20 per cent. On the other hand, it has to be recorded that the number of breakdowns of insured machines in 1904 exceeded the number in 1903 by 28 per cent. The rate of breakdown among dynamos was 1 in 12, the rate among motors 1 in 9·3, excluding breakdowns of starting resistance switches, or 1 in 8·2 including them; and, as it is beyond question that many breakdowns are prevented by the periodical inspection given to insured machines, it is evident that among uninsured machines the rate of breakdown must be heavier still. The ratios in which the different parts of the damaged dynamos and motors are thought to have contributed to the total are:

	Dynamos	Motors
Armatures and rotors	53 per cent	47 per cent.
Magnets and stators	7	11
Commutators and brush gear	2	18
Miscellaneous	10	8
Switches and resistances	28	16
	100	100

And the causes of the damage may be classified as under:

	Dynamos.	Motors.
Accidents	9 per cent	9 per cent.
Dirt and neglect	13	19
Age and deterioration	38	25
Bad workmanship and design	20	16
Overloading	3	3
Causes not ascertained	17	28
	100	100

The practical lessons to be gathered from the following brief descriptions, more than half of which relate to breakdowns due to defective workmanship or design, because these breakdowns more often teach useful lessons than those resulting from any of the other causes mentioned.

DEFECTIVE WORKMANSHIP MAIN CAUSE OF BREAKDOWNS.

Small bi-polar series-wound motor, coupled direct to the spindle of a 42 in. Blackman ventilating fan. The fuse melted and the ends of the copper brushes were rough and opened. Evidently the damage to the brushes had been caused by the motor running backwards through the action of the wind upon the fan.

The accident is one of many due to the same cause and suggests the use of carbon brushes and of self-acting shutters on the outlet ducts of motor-driven fans.

Four-pole centre-hung shunt-wound motor, rated to take 45·5 amperes at 460 volts. Speed 625 revolutions per minute.

The motor had been stopped on account of sparking, excessive heating of the armature, and falling out of the automatic overload release which was set at 70 amperes.

The trouble was due to the fact that one end of the shunt circuit, as well as the negative brush lead, was connected to the terminal with which the negative supply cable was making faulty contact.

A loose contact on a fuse terminal on a motor circuit will produce the same result, and the melting of fuses attributed to the heat generated by imperfect contacts is in many cases due partly to the passage of excessive currents caused in the way described.

Completely inclosed 4 b.h.p. Lundell motor, taking current at 250 volts. The motor broke down. When opened, the lower part of the field coil was found to be saturated and partly burnt out. The oil had run down from the bearings and accumulated in the bottom of the casing, which, was, as usual, unprovided with a dram.

This is but one of many similar cases which prove the necessity of making provision for draining the casings of all protected and enclosed machines in whatever positions they are fixed, a matter which has not received the attention it deserves.

Series wound [illegible] taking current at 200

volts, and connected by a coupling on the end of the armature spindle to the hoisting motion of a crane. The armature shaft broke off at the shoulder against which the coupling abutted.

ALTERNATIONS OF STRESS.

The weakening effect of abrupt changes of section and sharp notches in shafts is duly appreciated by most makers of steam engines, but makers of dynamos and electric motors seem quite indifferent to it; yet considering the enormous number of alternations of stress in a given time on the shafts of these machines every possible device should be resorted to to minimise their effect. Considering that these small shafts often make from three to four million revolutions per week of 56 hours, it is wonderful that they live so long as they do.

Four-pole inclosed shunt-wound 20-b.h.p. motor, taking current at 110 volts and running at 560 revolutions per minute. The commutator consisting of 110 segments 9 in. long was built upon a cast-iron quill or sleeve, and secured at one end by a collar on the quill and at the other by a clamping ring. This ring was fastened to the cast-iron quill by six steel screws $\frac{3}{8}$ in. diameter, with cheese heads recessed into countersunk holes on the face of the clamping ring and screwed into the end of the quill parallel to the motor shaft. The commutator segments got loose and began to rise, and on examination the six screws which held the clamping ring were found to be broken between the heads and the parts which were screwed into the quill.

As the screws were tightened with a screw-driver it is inconceivable that they could have been broken by excessive force applied by the workman, and the suggestion is made that they were broken by the stress caused by the expansion of the copper segments due to heat. This suggestion is not so far fetched as may at first sight appear.

STRESS FROM EXPANSION OF COPPER SEGMENTS.

The expansion of the copper bars 9 in. long would be ·00009 in. per deg. F. rise of temperature, while the expansion of the cast iron quill would only be ·000054 in. Suppose when working the temperature of the copper 50 deg., and that of the iron 20 deg. above the temperature at which the commutator was put together, then the difference in the expansion of the two would be (·00009 × 50) − (·000054 × 20) = ·0033 in., and this would be the amount by which the screws and the quill would have to stretch. Supposing the whole of the stretching to take place between the heads of the bolts and the end of that quill, that is in the parts which passed through the clamping ring, a length of about $\frac{1}{2}$ in., then, with a modulus of elasticity of 30,000,000 lb. per square inch the stress on the bolts would be 30,000,000 × ·0033 ÷ 0·5 = 198,000 lb. per square inch. Of course, the actual stress was not so great, because the quill notwithstanding its enormously greater cross-sectional area must have stretched to some extent as well as the bolts, while the insulating material between the ends of the coppers bars and the collar and clamping ring which held them must have been to some extent compressed. Still the rough calculation indicates the magnitude of the stresses set up by even a small amount of expansion when it has been taken up by a short piece of material.

Compound-wound six-pole dynamo, giving 125 amperes at 200 volts when running at 575 revolutions per minute, used for lighting a spinning mill in the morning and evening and for charging a battery in private house during daylight. One day on switching the dynamo on to the battery the fuses melted. Inspection discovered the polarity of the dynamo field reversed, so that when switched on to the battery the armature was in circuit with it, thus short circuiting the system.

REVERSAL OF SERIES CURRENT.

The inspector was unable to find out how the direction of the series current became reversed, but [illegible]

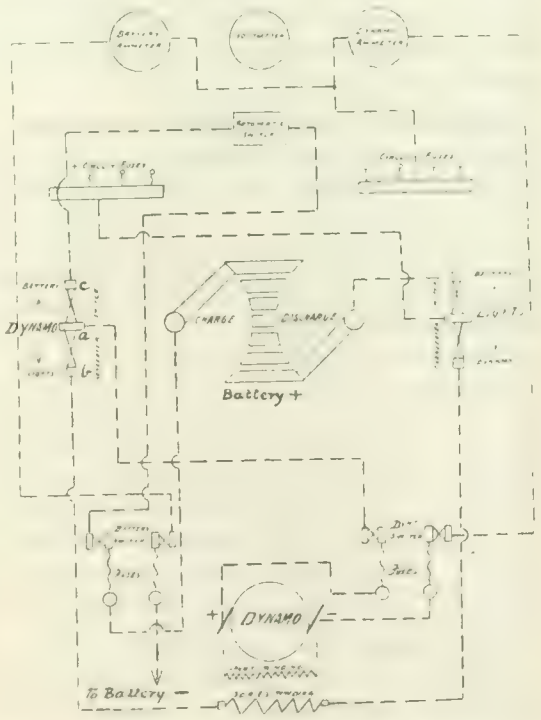


FIG. 1. SUGGESTED ARRANGEMENT BY WHICH IT IS IMPOSSIBLE FOR SERIES WINDINGS OF DYNAMOS TO BE PLACED IN CIRCUIT WITH THE BATTERY.

accidents [illegible] it may be taken as an axiom of good practice that the series windings of compound machines should never be in circuit with a battery.

As the danger is not generally understood, it may be well to explain how it may be avoided

One of the most common devices is the insertion of a short-circuiting plug to cut out the series windings; but this is unsatisfactory, because the plug may be forgotten, or the presence of a little dirt on the plug or socket may prevent effective contact.

The arrangement recommended is shown by the diagram (fig. 1), from which it will be seen that it is impossible to place the series windings of the dynamo in circuit with the battery, because the change-over dynamo switch cannot connect *a* with the contacts *c* and *b* at the same time.

It is also clear that the lighting circuits cannot receive current direct from the dynamo when the latter is running at the higher voltage required for charging the battery.

Other cases quoted emphasise the necessity for first class workmanship in the fitting of spiders, cores, and keys in dynamo construction. If sprinking or forcing by hydraulic pressure is not to be resorted to, nothing but the most accurate fitting will insure durability. A point to be insisted on is the advantage of fitting both the armature core and the commutator on one sleeve, so as to reduce the risk of relative movement to a minimum.

INSUFFICIENT INSULATION AND ITS EFFECTS.

Another common fault of construction is insufficient insulation between parts likely to be short circuited by films of oil and copper or carbon dust, such as the brush holder spindles, terminals, commutator bars, and metal part of machines, particularly those with earthed frames. In the case of brush holder spindles and terminals the insulating washers are often of too small diameter, and in case of commutators the edge of the insulating material, instead of being turned over the external circumference of the clamping ring to cover it and form a comparatively broad belt separating the copper from the ring, is frequently turned off to the same diameter as the ring, leaving only about $\frac{1}{8}$ in. less, or for the current to pass over. These are some of the weakest parts of the ordinary dynamos and motors, and their improvement might usefully occupy the attention of makers.

Various methods of connecting the shunt coils of motors having wire resistances in the starting switches to prevent breakage of the shunt circuits have been set out in previous official reports, and the necessity for adopting one or other of them seems to be more generally admitted than it was five years ago.

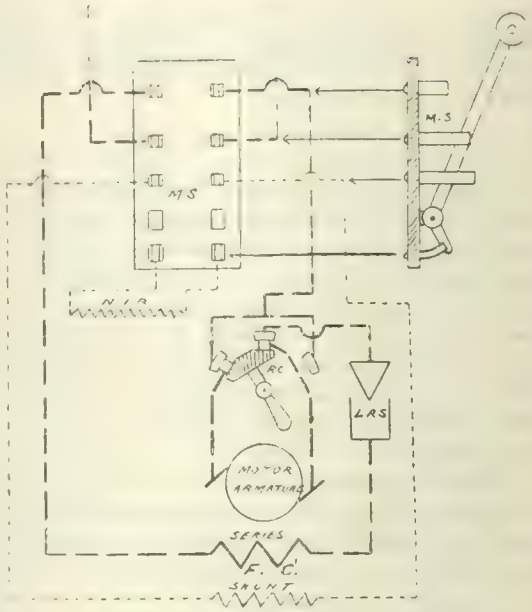


FIG. 2. SHOWING SPECIAL FORM OF MAIN SWITCH RECOMMENDED.

These methods, however, are not always easily adapted to motors controlled by liquid starting switches and the problem is still further complicated by the introduction of a reversing controller. Therefore it often happens that it is not possible to arrange the connections so that the shunt circuit may always remain closed on the motor armature, and some other device is necessary to "damp down" the inductive effect which the breaking of the shunt produces. This device consists in putting a non-inductive resistance in parallel with the shunt, of sufficiently low resistance to prevent a dangerous rise in voltage when the circuit through the shunt is broken. Sometimes a bank of lamps is placed permanently in parallel with the shunt, but this arrangement is somewhat wasteful. A better plan is to use some special form of main switch like that shown in the diagram, fig. 2, which will throw the non-inductive resistance into parallel with the shunt just before the main circuit is broken.

The arrangement has also the advantage of first disconnecting everything except the shunt circuit so that the armature and other parts, which are seldom as well insulated as the magnet coils, are not exposed to the rise in voltage which even the introduction of the non-inductive resistance does not entirely prevent.

EARTHING PROBLEMS.

On the subject of "earthing" it seems advisable to remind the owners of electric cranes of the necessity of efficiently earthing the rails on which they run, particularly when the current is taken from a 3-wire

system with the middle wire earthed. There seems to be an idea that a crane running on iron rails must be efficiently earthed; but where these rails are carried on wooden bearers this is not so, and the rails themselves must be connected to earth to make the system safe.

The advantage of properly earthing all metallic conduits and pure boxes was clearly shown by the following case: One day the earth detector lamps on the main switchboard in a colliery power-house supplying continuous current at 550 volts for lighting and power, indicated an intermittent earth on one of the circuits, which was used for lighting a pit about 1½ miles away On the following day the circuit breakers fell out and the pit was left in darkness. The lamps were of the [illegible] 100-volt bayonet socket type with brass caps [illegible] series across the mains. The cap on the first lamp of one of the sub-circuits of five had become softened by moisture, which destroyed the insulation between one of its terminals (which may be called the positive) and the lamp holder, which was screwed into the earthed metal conduit. While the lamp holder was thus earthed a fault developed on the negative pole of the main switch controlling the sub-circuit, earthing it, and thereby short circuiting the mains, fusing the defective lamp and its holder, and throwing out the circuit breaker. At the time this occurred men were working on the conduits making alterations in the wiring but with complete immunity from shocks, owing to the conduits being well earthed.

MR. ERNEST WILLIAMS, A.M.Inst.C.E., M.I.M.M.

Mr. Ernest Williams whose portrait appears on page 875, is a native of Flaxley, in the Forest of Dean, Gloucestershire. Born in 1861, he received his education under Dr. MacLaren, at Cinderford. In November, 1876, he was articled as a civil and mining engineer to Mr. John M. Johnson, of Hexham, Northumberland, and in June, 1877, his articles were transferred to the late Mr. T. J. Bewick, M.Inst.C.E., of Haydon Bridge and London. He completed his pupilage in November, 1883, and from that time till February, 1888, he served as an assistant to the late Mr. Bewick, and gained considerable experience in hydraulic, railway, and mining engineering. He had charge of collieries and metalliferous mines in Northumberland, Durham, Cumberland, and Wales, and for some time was superintendent of the Lead Smelting works belonging to Bewick and Partners, Ltd., at Hebburn-on-Tyne.

In February, 1888, Mr. Williams took up the position of chief assistant to Messrs. Bewick and Moreing, in London. In November, 1889, he went to Johannesburg as assistant to Messrs. Bewick, Moreing and Alford, which position he held till May, 1892, when he set up a practice in Johannesburg on his own account, and was consulting engineer to the Transvaal Coal Trust Company, Ltd., Cassell Coal Company, Ltd., New Kleinfontein Company, Ltd., Van Ryn Estate and Gold Mining Company, Ltd., and other corporations.

Mr. Williams went to Western Australia in 1893, as resident partner in the firm of Messrs. Bewick, Moreing and Co., and had much to do with the reorganisation of the gold mining industry there. Under his direction the successful inauguration of dry crushing of ores at the Hannan's Brownhill Gold Mine on the Kalgoorlie goldfields was accomplished, and he was one of the first engineers to recognise the value of the tube mill in the reduction of gold ores.

He introduced, as far as possible, the Rand style of equipment, and during his stay there was president of the Coolgardie Chamber of Mines. In 1899 Mr. Williams returned to Johannesburg, as South African partner in the firm of Bewick, Moreing and Co. Four years later he resumed practice on his own account, continuing to act as local representative of his old firm.

Mr. Williams is one of the foundation members of the South African Association of Engineers, of which society he is president for the year 1904-5. He is an associate member of the Institute of Civil Engineers, a member of the Institute of Mining and Metallurgy, and a member of several technical societies of South Africa.

"FLATHER" 16-in. QUICK-CHANGE GEAR LATHE.

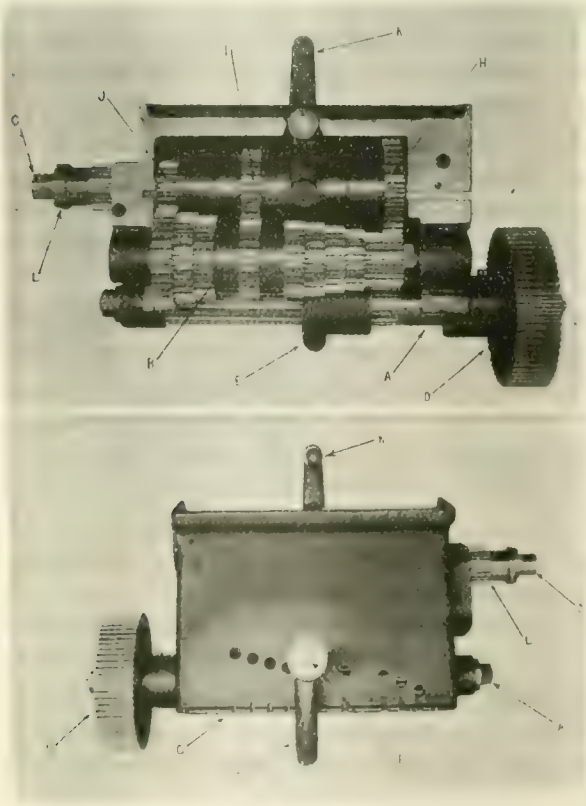
BY T. S. BENTLEY, A.M.I.M.E.

ON page 885 is illustrated the "Flather" 16-in. quick-change gear lathe, with special reference to the new feed mechanism, of which two views are given below.

On the front of the lathe is mounted a box, in which are located three shafts; the lower one A being the driver; the middle one B having attached to it nine gears arranged in the form of a cone, but with two vacant spaces left, as shown; and the upper one carrying three clutch-gears H, I, and J, arranged to mesh with corresponding gears on shaft B.

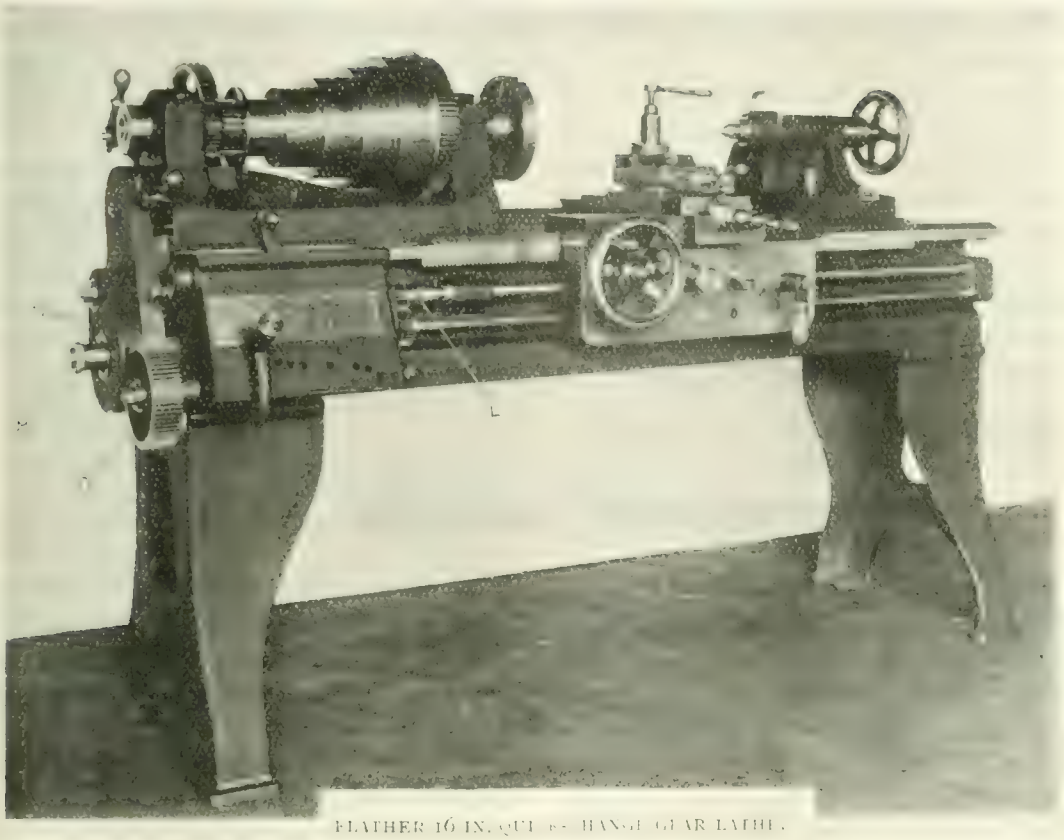
Power is transmitted, by means to be described later on, to the wide-faced gear D, splined to the shaft A. Teeth are cut in this shaft, a portion of its length forming a long pinion integral with the shaft. On this long pinion slides the lever E, carrying an intermediate gear (not shown), which is constantly in mesh with the long pinion and will transmit motion to either of the gears mounted on shaft B, if the lever E is moved opposite the required gear and raised till the locking pin F enters the hole provided for that purpose.

To assist in locating the levers correctly, and to guard against injury to the corners of the gear by accidental contact while being shifted, a steel strip G is fixed to the lower edge of the gear-box. In this strip are slots corresponding in number and position with the locking-pin holes. On the lever E is a projection which prevents it from being raised except when correctly in place. When lowered clear of the strip, the lever can readily be moved to any desired position, and in this way nine threads or feeds can be obtained.



THE FEED MECHANISM.

The number of changes available is increased from nine to twenty-seven by means of the three clutch gears on the shaft C. The gears H and J run free on the shaft, and are permanently in mesh with corresponding gears on shaft B. J engages with a gear double its own size, and H with one only half as large as itself. Gear I slides freely on shaft C, to which it is splined, and its position is controlled by lever K, which projects through the top of the box. When the lever is in the centre position, gear I engages with an equal sized gear on shaft B, and the two shafts then run at the same speed. When the lever is moved to right or left, gear I slides out of mesh with its mating gear into one of the spaces left in the cone for that purpose.



FEATHER 16 IN. CUT-AWAY HAND GEAR LATHE.

If the movement is continued, one of the clutches (provided on both sides of the hub of gear I) will engage with the corresponding clutch on gear H or J, as the case may be; and the speed of shaft C will be either half or double that of B, according to whether motion is taken through the one or the other. To obviate any risk of the clutches working out of engagement, gear I is provided with a spring pin which enters suitable notches in shaft C, and prevents unintentional movement. It will thus be seen that, by simply moving lever K, three feeds—coarse, medium, and fine—are instantly available; and in the maker's works it is the practice to use this lever for changes in turning feeds in preference to the lower lever E.

The shaft A is driven as follows: Motion is taken from the lathe spindle, through the tumbler gears in the ordinary way, to the stud gear at the end of the headstock. A sweep, mounted so as to swing around the stud gear, carries two trains of gearing enclosed in the case N, which protects both the gears and the workman from injury. The stud gear drives a double intermediate, which in turn drives a second pair arranged to slide in and out by means of the knurled knob M. The larger of this last pair is normally in mesh with the wide-faced gear D, and has two rates of speed according to its position, which determines from which train of gearing it derives its motion. In this way the number of changes is again increased from twenty-seven to fifty-four.

On the 16-in. lathe, threads from 2 to 128 and feeds from 7 to 448 per inch are obtained without the use of change gears. In case an odd thread is required which is not provided on the index, the gear D can be removed and one

with the necessary number of teeth substituted, the sweep being made adjustable to allow of such changes.

It will be noticed that both lead-screw and feed-rod are provided and connected with the gear box by means of the sliding clutch gear L, which is mounted on shaft C. When pushed forward the clutch engages with a corresponding one on the lead-screw, and the feed-rod is left stationary; when drawn back the clutches separate and the gear slides into mesh with the one immediately below it keyed to the feed-rod. In this way the act of connecting one motion throws the other out of gear and entirely prevents all possibility of both motions being in operation at the same time. A common accident is thus effectually guarded against.

Although the 16-in. lathe only is described here, the same device can be fitted to all sizes of "Flather" lathes from 14-in. to 28-in. swing inclusive. The firm is represented in England by Messrs. Charles Churchill and Company, Ltd., 9 to 15, Leonard Street, Finsbury, E.C.

THE PETROLEUM OUTLOOK AT BAKU.

At the recent annual meeting of the European Petroleum Company the damage done to the oil wells by the incendiaries of Baku was thrown into high relief. The company appear to have been continually menaced by fire and water. As early as November an accident occurred to one of their best producing wells, which was flooded, the water spreading to two other wells, and taking all three out of exploitation. Steps were immediately taken to repair the damage, and the work was carried out within two months, after which the three wells again entered into exploitation. The strike commenced on December 13th and when they were able to resume work again it was found that the oil had been entirely replaced by water in one or two of their wells, the oil source, evidently, having been closed by a landslip which had occurred during the stoppage, owing to which the head of the liquid fell. In addition to this, two other wells, which had recently given 800 to 1,000 poods per day were also flooded. On December 27th the property belonging to the Caspian Society adjoining one of the companies' properties, was fired by incendiaries. The fire spread to some of the latter's properties and destroyed sixteen derricks and two reservoirs, besides doing much damage to machinery and pipe lines. The reinstatement of the properties was commenced immediately, but owing to unprecedently bad weather it was not until the end of January that all their bailing wells came into exploitation, and then their output did not exceed 25,000 poods per day as against nearly 40,000 poods per day before the strike commenced.

It was stated that the actual loss of the company's property had not been great, though, of course, the total loss through cessation of work was very serious. This was due to the gallant defence made by the company's employés who were specially thanked at the meeting. The chairman spoke hopefully of the future, but he expressed the hope that the Government would realise for their own sakes the necessity of ensuring freedom from disturbance at Baku. It seems that in the recent riots no fewer than 1,775 pertoleum wells were destroyed in Balakhani, Sabunchi, Romani, Bibi-Eibat, and Zabrat —namely, 910 that were in action, 366 that were being repaired or bored, and 499 that were inactive. The number of wells remaining was 1,219, of which 525 were active, 282 were being repaired or bored, and 412 were inactive.

THE IRON AND STEEL INSTITUTE MEETING.

THE INFLUENCE OF NICKEL AND CARBON ON IRON

By G. B. Waterhouse (Buffalo, N.Y.).

Mr. Waterhouse presented a paper based on an investigation conducted in the metallurgical laboratory of the School of Mines of Columbia University in the City of New York, its object being to help on the study of the ternary alloys of iron, carbon, and another metal or metalloid, by considering a series of steels of constant nickel with varying carbon percentages.

The following conclusions are given :—

Nickel decidedly raises the tenacity without materially lowering the ductility. The elastic ratio, in pure nickel-carbon steels, is only slightly greater than that of carbon steels.

Annealing has a marked influence; it lowers the tenacity without greatly raising the ductility.

The constituents of steels with low percentage nickel are the ordinary constituents—ferrite, pearlite, cementite and graphitic carbon.

The pearlite of these steels shows a great readiness to segregate into its constituents: ferrite and cementite.

In this condition the cementite has the formula Fe_3NiC.

The eutectoid ratio in these steels appears to lie at about 0·70 per cent. carbon, but in the rolled steels no free cementite shows until the carbon reaches about 1·00 per cent.

Nickel lowers the transformation points Ar3·2 and Ar1 about 20 deg. for every 1 per cent. of nickel.

The cementite of these steels is very liable to precipitate its carbon as 'temper graphite."

WEAR OF STEEL RAILS ON BRIDGES.

By Thomas Andrews, F.R.S., M.Inst.C.E., F.C.S. (Wortley).

The author received from a railway company the fractured portions of a steel rail which had broken in main-line service on a bridge, and he made an investigation to determine, if possible, some of the causes leading to the breakage. It was stated that the rail was made by the acid Bessemer process, and from hæmatite pig iron. It had been laid on the main up, or the south-going line, on the bridge, on longitudinal timbers. The life of the rail was eleven years and five months.

Fracture No. 1, as seen opposite the direction of passing trains

Face of Fracture No. 1, as seen in the direction of passing trains.

Fracture No. 2, as seen opposite the direction of passing trains.

TABLE II.—*Chemical Analyses of the Fractured Rail.*

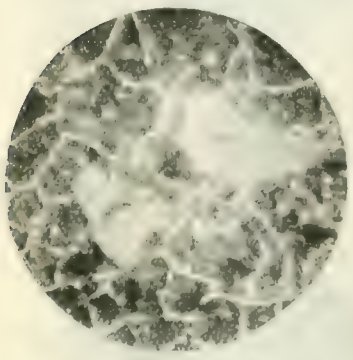
	Column 1. Longitudinal Position. 6 inches from End of Rail first taking the Trains. Position in Vertical Section.				Column 2. Longitudinal Position At Fracture No. 1, 2 Feet 1 Inch from Rail End first taking the Trains. Position in Vertical Section.				Column 3. Longitudinal Position. Near Fracture No. 2, 4 Feet 4 Inches from Rail End first taking the Trains. Position in Vertical Section.			
	Top of Rail Head	Junction of Rail Head with Web	Rail Bottom	Approximate Maximum Percentage of Segregation.	Top of Rail Head	Junction of Rail Head with Web	Rail Bottom	Approximate Maximum Percentage of Segregation.	Top of Rail Head	Junction of Rail Head with Web	Rail Bottom	Approximate Maximum Percentage of Segregation.
Combined carbon by coloration test	0·510	0·340	0·480	50	0·495	0·350	0·450	41	0·520	0·320	0·450	62½
Silicon	0·086	0·078	0·088	12½	0·093	0·080	0·096	16½	0·097	0·086	0·088	12½
Manganese	1·361	1·282	1·358	6¼	1·368	1·318	1·376	4½	1·413	1·334	1·441	8
Sulphur	0·077	0·040	0·071	92½	0·070	0·040	0·070	75	0·079	0·044	0·077	79½
Phosphorus	0·074	0·043	0·067	72	0·071	0·048	0·067	48	0·078	0·046	0·075	69½
Iron by difference	97·892	98·217	97·936	..	97·903	98·164	97·904		97·813	98·170	97·869	
	100·000	100·000	100·000		100·000	100·000	100·000		100·000	100·000	100·000	

N.B.—It may be remarked that the percentage of the combined carbon at the top of the rail head, close to Fracture No. 2, was 0·52, and that at the side of the rail head the combined carbon was 0·46 per cent., whereas, at the junction of the rail head with the web the combined carbon will be seen to be present to the extent only of 0·32 per cent. See column 3 in the above table

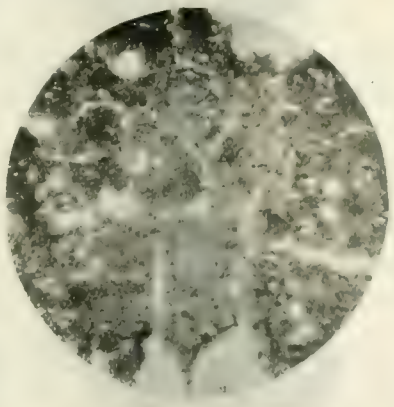
The length of the rail was 30 ft., the original section was of the ordinary standard bull-headed type of 90 lb. per yard; and the present section was 82·17 lb. per yard; this shows an average loss of about 0·69 lb. per yard per annum, from wear and corrosive action. It had not been laid on ballast, and the track was level.

The trains taking the rail were under full steam at an average speed of from 15 to 20 miles an hour. It had not been subject to the skidding action of braked wheels. It had fractured in two places; Fracture No. 1 being 2 ft. 1 in., and Fracture No. 2 being 4 ft. 4 in. from the end of the rail first taking the trains. It will be thus seen that the two fractures were about the same distance apart as the two first chairs at the on-going end of the rail.

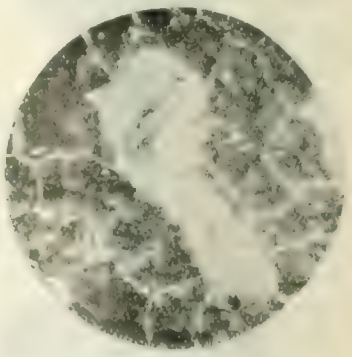
An approximate estimate was made of the total traffic weight which had passed over the single line of rails of which the broken rail formed part. It was estimated that a total of about 296,000,000 tons had passed over the single track during the time life of the rail; dividing this by two, gives a total weight of 148,000,000 tons which had rolled over and been actually borne by the fractured rail.



Micro-crystalline Structure, Fractured Steel Rail, 90 lb. Section. Time life, 11⅝ years. Transverse section, 0·25 in. below rail face at Fracture No. 1, showing internal micro-flaws



Micro-crystalline Structure, Fractured Steel Rail. Longitudinal section, rail face, showing segregated structure at Fracture No. 1.



Micro-crystalline Structure, Fractured Steel Rail. Transverse section, 0·25 in. below rail face at Fracture No. 1, showing internal micro-flaws.

The appearance of the opposing faces of Fracture No. 1 are illustrated on page 887. The left hand figure shows the face of Fracture No. 1 as seen opposite the direction of passing trains. The centre figure shows Fracture No. 1 as seen in the direction of passing trains.

In Fracture No. 2, the upper portions of the rail head are seen to have broken with a clean-cut surface, and the fractures generally showed a brittle nature, except in some local places. The main features of the fractured faces generally confirmed the results of the chemical, physical, and microscopic examinations, and afforded visible indications of the locally varied chemical and physical structure of the rail.

The various analyses of the rail present features of considerable interest, the combined carbon, sulphur and phosphorus being locally segregated, to a considerable extent, around the outer periphery forming the contour of the rail head.

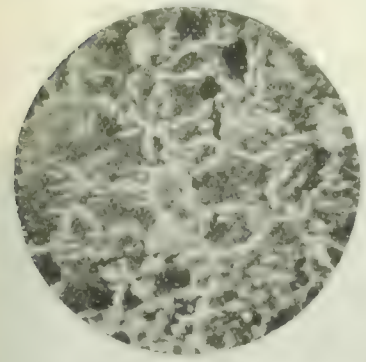
In the steel at and about the bottom flange of the rail, the percentage of combined carbon was excessive for rail steel, and the silicon was more than desirable, moreover the manganese was present in very great excess; the sulphur and phosphorus were satisfactory.

The non-uniformity of chemical composition is seen on referring to the table on page 888. This rail is in fact a typical sample of a segregated high carbon and high manganese rail, which class of rails almost invariably has a tendency to suddenly fracture in main-line service. The author has recently examined, for several English railway companies (for whom he acts as consulting metallurgical chemist and testing engineer), rails of this type, which have shown brittle qualities and have suddenly broken after comparatively short main-line service. The rail bears internal evidence of having been originally made from good pig iron, but in the manipulation an excessive percentage of combined carbon and manganese has been allowed, which has been detrimental to the physical structure and permanent endurance of the rail.

The analyses of the various parts of the rail have shown that the chemical constituents are disproportionately balanced, the result of which has been a rail of unsatisfactory brittle nature. Confirmation of this is also afforded by the results of physical tests, and by the results of microscopical examination.

The whole of the microscopical examinations made showed that there was a considerable want of both chemical and physical uniformity of micro-crystalline structure throughout the mass of the rail as a whole. They have further shown the local segregation of the chemical elements existing in the various parts of the vertical section of the rail.

The microscopic examinations have also shown the undesirability of employing rails having too high a percentage of combined carbon and manganese, and they have also indicated that great care should be exercised in the thermal treatment of rails, from the ingot to the finished rail, in order to obtain a suitable micro-crystalline structure resulting in a good durable rail.



Micro-crystalline Structure, Fractured Steel Rail. Transverse section, rail head and web junction at Fracture No. 1, showing internal micro-flaws. Less in weight, 0·60 lb. per yard per annum. Total traffic weight carried by this rail, 145,000,000 tons. Reduced from a magnification of 250 diameters.

Microscopic Effects of Compressive Stress, Fractured Steel Rail. Rail face polished and compressed 5 per cent. of original size, showing development under stress of crystalline slip and fine transverse fissures, starting from longitudinal micro-flaws of sulphides or other impurities, near Fracture No. 1.

Microscopic Effects of Compressive Stress, Fractured Steel Rail. Rail face polished and compressed 5 per cent. of original size, showing development under stress of crystalline slip and fine transverse fissures starting from longitudinal micro-flaws of sulphides or other impurities, near Fracture No. 1.

With regard to the cause of external local segregation in steel rails, the author has demonstrated that local internal segregation mostly exists in those rails which represent the top part of an ingot. During the cooling of large steel ingots he thinks that in addition to local segregation, near the top of an ingot, there may sometimes be a further transverse migration of the carbon and other elements from the central axial part towards the exterior of the ingot. This tendency to external migration of the chemical elements he considers is most likely to occur near the bottom or wider part of the ingot. Now, when such an ingot is rolled into a rail, say 90 ft. long (which is finally cut in 30 ft. lengths), that rail representing the bottom of the ingot is likely from the above cause, to manifest a condition of local external segregation, as distinct from interior axial longitudinal segregation; whereas the rail representing the top portion of the ingot would probably afford indications only of internal local axial segregation.

The author further thinks that the keeping of steel ingots for any lengthened period in "soaking pits" tends to promote local segregation of some of the chemical constituents.

If either internal or external local segregation arising from any cause is present to any considerable extent, it becomes a serious source of danger leading to the sudden fracture of rails.

The fractured rail now under consideration affords a practical example of the risk arising from rails of this type, and this fractured rail is in fact a very marked type of external local segregation, which condition has apparently promoted the sudden fracture of the rail. The author considers that this state of segregation was initially derived from the ingot, and that it has simply been continued in the rail during the final process of manipulation.

The author thinks it would be desirable to use a heavier section of rail for bridge or tunnel traffic than the section of the rail now examined, and he prefers for bridge work to use a wide, flat-bottomed rail of heavy section, as he believes heavy-sectioned, flat-bottomed rails, on longitudinal sleepers, will yield more reliable results in main-line traffic for bridge or tunnel service than the ordinary bull-headed type of rails resting in chairs. If, however, bull-headed rails with transverse sleepers are employed, it is very desirable to have in tunnels or on bridges a greater number of sleepers placed nearer together, and also to have specially large sleepers beneath the fish-plate joints at the ends of the rails. In case rails of a heavier section are used, it is important that the ingots from which they are rolled should have a proportionately increased transverse sectional area.

THE USE OF FILES.

A VERY effective and suggestive cover design which at once tells its own tale is that adopted by Messrs. Cammell, Laird and Co., Ltd., in connection with their file department. The following hints on the use of files are included in this catalogue.

A new file should always be used with a light pressure on the work till the needle-like points of the teeth are worn away; after this a much heavier pressure may be used with much less danger of breaking off the teeth at their base. Many new files are violently diminished half their efficiency (or life) by a few careless strokes when first applied to the work. Do not use a new file on the chilled and gritty skin of castings or on a weld where borax or any vitreous fluxes have been employed. No file can endure such usage.

Every filer should be required to keep a worn file with which to attack first the rough, gritty, or oxidised surface of iron work, and thereby pave the way for a more efficient work with his shape files. A piece of gritty or chiselled casting that would rapidly destroy the cutting qualities of a new file would produce scarcely any damaging effect on a worn file. In filing steel, better results can generally be obtained by using files of a grade not coarser than "second cut," finer grades being employed according to the finish and delicacy of the work under manipulation.

Persons using files should always seek to discover the fitness or adaptability of cut and form of files especially suited to their work. No one should expect the best results from a file on brass or gun-metal which was intended for use on iron or steel, and in ordering files it is of advantage to both the user and of the manufacturer to specify the principal material upon which it is intended to use the files.

A FILE CATALOGUE COVER.

ELECTRICAL EXHIBITION AT OLYMPIA.

CROSSLEY BROS., LTD.

THE gas plants of this firm have been too long before the public to call for any detailed notice. Even the suction plant has now become a familiar feature to engineers. It consists, first, of the generator or producer; second, the coke-scrubbers for cleaning the gas; and third, an expansion box to take the place of the gas bag ordinarily used with a pressure system. The Crossley plant is distinguished by its extreme simplicity, and working on the regenerative principle gives great economy. The difficulty of obtaining a uniform quality of gas with varying loads has been got over by an ingenious arrangement of cocks opening from the air space above the water in the saturator into the open air. Through these openings the steam escapes at light loads. Coke is now used with success in the suction type of plant for large sizes. The "R E" type high-speed gas engine and dynamo combined is shown in fig. 1. This engine is capable of giving 27·5 effective horse-power as a maximum with town gas, and 21·5 effective horse-power as a maximum with suction gas. The engine is driven

[illegible] type gas engine, high speed, is also shown. This engine is capable of developing 16 effective horse-power as a maximum with town's gas, and 12·5 effective horse-power as a maximum with suction gas. It is [illegible] used for lighting the stand. The "L L E" type high-speed electric lighting oil engine and dynamo combined is another feature of the exhibit. This latter engine is capable of developing 4½ effective horse-power as a maximum

STEWARTS AND LLOYDS. LTD.

As manufacturers of steel tubes, this company enjoys a high reputation, and they show a representative exhibit of their manufactures, restricting same to their various specialities pertaining to electrical installations and equipment generally. The principal exhibits consist of electric tramway poles of both tapered and three-section make, the former 31 ft. long and tapered uniformly from end to end in one piece, and the latter of parallel lap-welded tubes shrunk together, and of a similar over-all length, with pole mountings representing the latest practice in Span Wire and in Side Arm and Double Arm Poles, both with bent and straight arms. They also show some examples of lap-welded

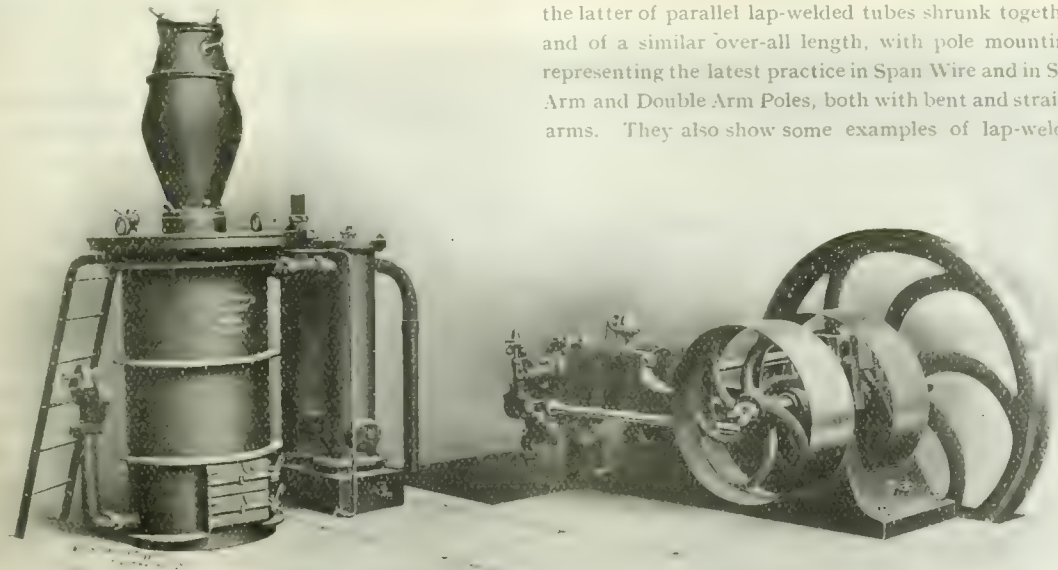


FIG. 1. SUCTION GAS PLANT BY MESSRS. CROSSLEY BROS., LTD.

steel steam mains [illegible] their welds on flanges. The Mephan Ferguson [illegible] pipe should be noted. This pipe is used for the 30-in. Coolgardie water main, 380 miles long, and also for the Adelaide, Melbourne and Sydney, and other Colonial water supplies. The pipes have recently been applied to power gas mains and for high-pressure electrical generating power mains where their great strength suggests a future for them. In hydro-electric installations long pipe lines are required from 30 in. to 60 in. diameter and for pressures exceeding 500 lb. per square inch, and the Ferguson lock bar pipe is claimed to possess the necessary qualities.

TEMPERLEY TRANSPORTER COMPANY.

This company has an attractive exhibit of working models of distinctive types of "Temperley" patent transporters for unloading and loading vessels and railway trucks and handling coal and other material.

The exhibit includes a fixed transporter fitted with "Temperley" grab, at an electrical generating station, showing the company's latest method of handling coal or other material with grabs. There is also shown a "Temperley" travelling tower transporter, working patent automatic dumping skip, discharging coal from vessels on to stock-heap or into railway wagons, and a patent portable transporter rigged on vessel's derrick, for discharging cargo, worked by vessel's own winch.

[illegible] the company's stand at Olympia, showing the models and transporters exhibited.

The engines, which are illustrated in fig. 3 are capable of lifting the full load at a speed of 250 ft. per minute, and of travelling the load along the transporter beam at a speed of [illegible] to 800 ft. per minute. Machinery is fitted for raising and lowering the hinged arm of the transporter which projects over the vessel, and for travelling the tower along the rails in either direction. The hoisting drum runs loose on the shaft for lowering, and is put into gear for hoisting by means of [illegible] cone of large diameter; the engine is not, therefore fitted with reversing gear, and the wear and tear of ordinary link action is avoided. The engines are operated from an elevated platform, which gives the driver a clear view over the stock heap and into the vessel which is being discharged.

DIESEL ENGINE COMPANY.

This company exhibit a 20 h.p. crude oil engine direct coupled to a dynamo, this type of plant being designed for private house lighting. Among the advantages claimed for it are the absence of smoke and smell, and the absolute safety of the fuel used may be singled out as special features.

As regards the cost of current generated, with crude oil at 40s. per ton (2d. per gallon) about 10 b.h.p. for an hour is stated to be obtained for 1d. which means that [illegible] 16 c.p. or 20 8-c.p. lamps can be lighted for only 1d. per hour.

FIG. 2. VIEW OF STAND, TEMPERLEY TRANSPORTER COMPANY.

BRITISH PROMETHEUS COMPANY, LTD.

One of the objects of the Exhibition is to demonstrate the application of electricity for heating purposes, and the exhibition of this company attracted the attention of all those interested in the development of the use of such apparatus. The reduced tariffs now in force at the majority of supply stations have assisted this process, and the advantages of electrical heating are made quite apparent by this company. A typical feature of the company's manufactures is the Prometheus Convector, a large

number of [illegible] in view at the Exhibition it may be of interest to state that these [illegible] have recently been installed in the first class battleship *Renown* and on the s.s. *America* the giant liner running in the American service.

UNION ELECTRICAL COMPANY, LTD.

The E.V. arc lamp of this company, is being exhibited for the first time at the Electrical Exhibition where it is shown in different combinations.

It is designed as a single arc burning either singly enclosed or doubly enclosed, with very long burning hours, reaching up to 300 hours with the five ampere lamp on direct current circuit, with the consumption of 17¾ in. of carbon.

A second form is as a twin arc, that is to say, two arcs burning within the same globe, enabling the lamps to be connected individually directly on to the ordinary supply circuits of 200–250 volts.

The E.V. lamp with twin arcs is noteworthy in that each arc is independently controlled, so that the colour given from the lamp is constant, in distinction to other forms of arc lamp where there is only one controlling mechanism for both arcs, permitting one to burn at a different voltage to the other.

These lamps are also shown in connection with compensators, and other devices, rendering them particularly suitable for street lighting, or for lighting railway stations, where high voltage currents are available.

NATIONAL GAS ENGINE COMPANY.

This exhibit illustrated in fig. 4 can be used in combination with a gas engine connected directly with it.

A feature of the plant is that it has been designed on the heat regenerative principle. All the air used for making the gas is heated by waste heat from the body of the gas generator. The superheated steam required for making the gas is produced by waste heat. The fuel which is to be converted into gas is also heated by waste heat before it reaches the combustion zone.

When an engine works the suction plant, the engine itself governs the rate of producing the gas, to suit its varying consumption. No surplus gas can then be made, and as there is a partial vacuum in all parts of the plant, and in the piping, while the engine is working there should not be any escape or waste of gas. With any engine of good make, suitably adjusted to work with the suction plant, the consumption of small anthracite should it is stated, be about one pound, and with suitable coke about one-and-a-quarter pound per b.h.p. per hour.

When made, the quantity of gas equivalent to 1,000 cubit feet of ordinary town gas costs from 70 to 75 per cent. less than ordinary town gas at 2s. 6d. per thousand cubic feet, including fuel, labour, and repairs. The result is still more striking when the town gas is dearer.

MARRYAT AND PLACE.

This firm is showing an electric furnace in operation. A special service of 200 kilowatts has been laid into the exhibition for this purpose. For most experiments a current of 50 amperes is sufficient, but for some as much as 1,000 amperes 200 volts is employed. The furnace is of the Moissan type, and permits of easy modification in various ways for different classes of experiment.

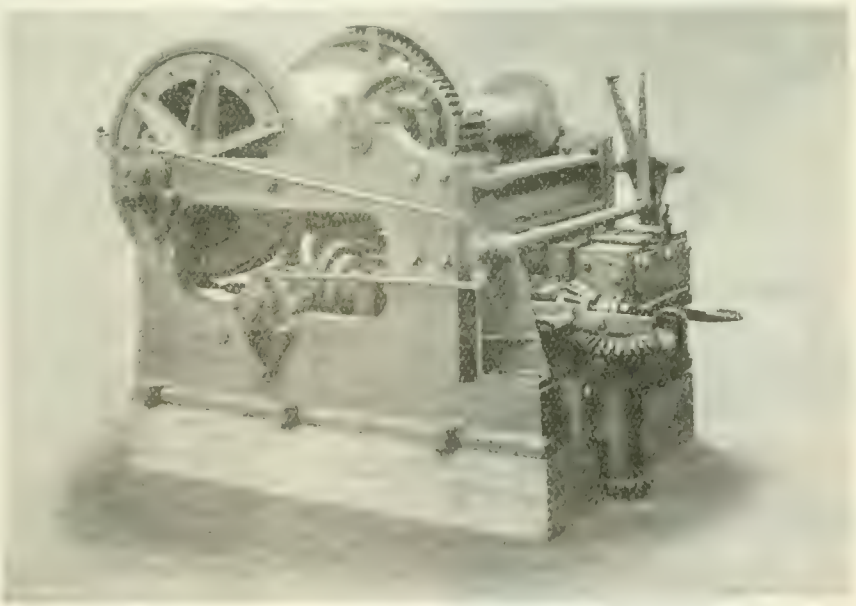


FIG. 3. MACHINERY FOR TEMPERLEY TRANSPORTER.
The engines are capable of lifting the full load at a speed of 250 ft. per minute.

The lining is of magnesite and carbon and is renewed daily. The electrodes are of round carbon 2 in. by 36 in. and a convenient arrangement of the holders allows the arc to be instantly extended from contact to 14 in. Temperatures can be obtained up to 4,000 deg. C. (7,232 deg. F.) at which point all known substances volatilise. A Fery pyrometer has been fitted up for checking the temperatures between 1,600 deg. and 4,000 deg. C. A feature of this type of furnace is the elipsoidal roof cavity which acts as a reflector condensing the heat rays from the arc upon the crucible below. Even though the roof may be fusing rapidly, the fused material runs down the sides and does not drop into the crucible, and the shape of the reflector remains the same long enough for the experiment to be performed. The exhibitors are repeating Professor Moissan's classical experiments including those on the artificial production of diamonds. On page 863 we show the furnace arranged for this purpose.

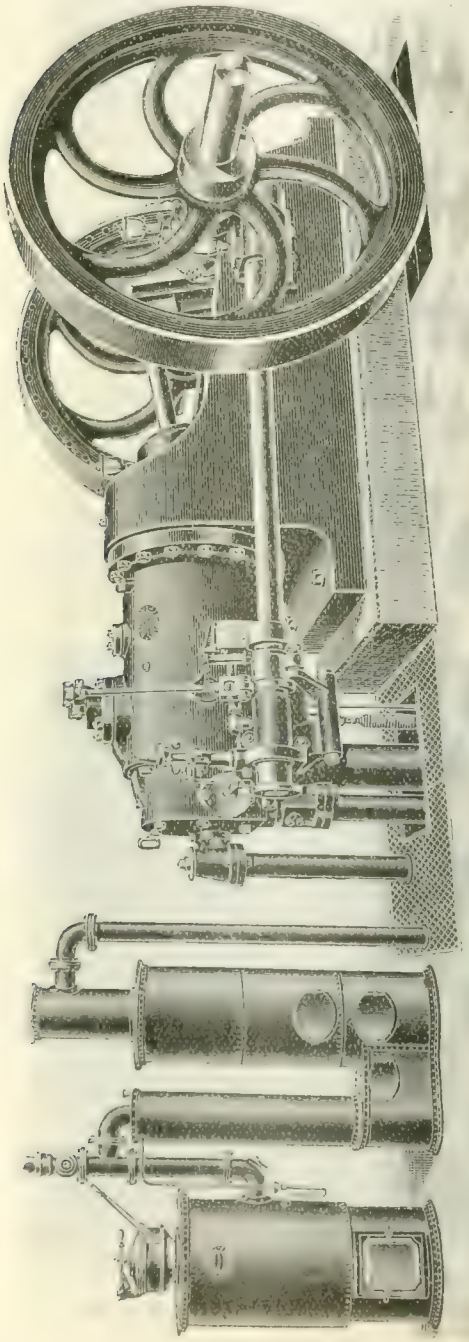


FIG. 4. SUCTION GAS PLANT BY THE NATIONAL GAS ENGINE COMPANY.

The firm also show an open arc two-pole furnace suitable for raising 4 cwt. charges of iron to the necessary temperatures for steel production. The exhibit is a model intended to show the principle only upon which the highest grades of tool steel are produced in existing installations.

THE STURTEVANT ENGINEERING COMPANY.

Have a very comprehensive display of their "Igranic" motor starter and controlling switches and rheostats at Stand No. 72 at the Electrical Exhibition at Olympia.

Prominent exhibits are the automatic lift controller of which the company have two types, namely, their rope operated lift controller, and the car switch operated lift controller. Both these controllers are very compact, and are claimed to ensure ease of running and freedom from risk.

The car switch operated controller is very simple in action. Starting, stopping and reversing the motor are all effected by the operation of a neat switch in the car, and as in the case of the float switch, this car switch is only called upon to make and to break auxiliary circuits, and consequently the arcing in the switch is neglible. All making and breaking of the motor circuit is effected by solenoid operated switches on the controller fitted with the usual carbon break and magnetic blow-outs.

Examples of these lift controllers are shown in operation.

Another feature illustrated in the exhibit is the "Igranic" Machine Tool Controller, by which speed regulation up to 4—1 can be obtained by inserting resistance in series with the shunt field alone.

They are of two types, the familiar drum pattern and the slate front pattern, and they can be provided either for reversing or non-reversing motors, and, needless to say, provide an economical method of machine tool control.

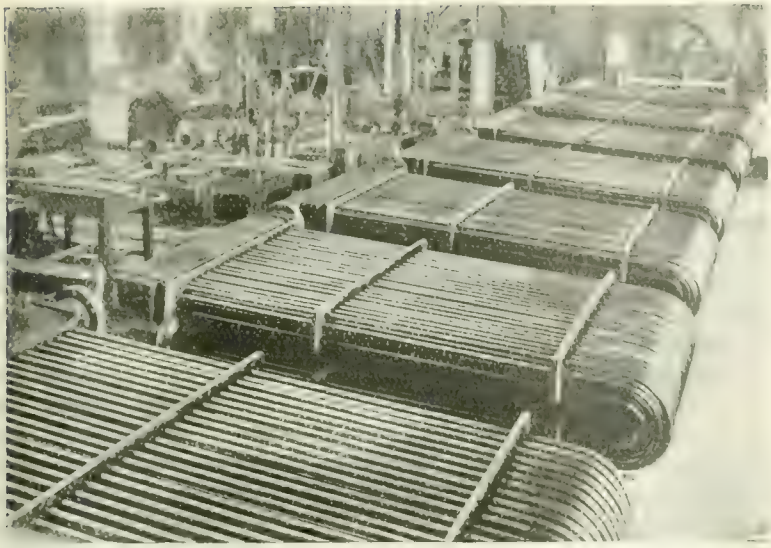


FIG. 5.—SUPERHEATERS SUPPLIED TO THE BRITISH ADMIRALTY BY MESSRS. MCPHAIL AND SIMPSON.

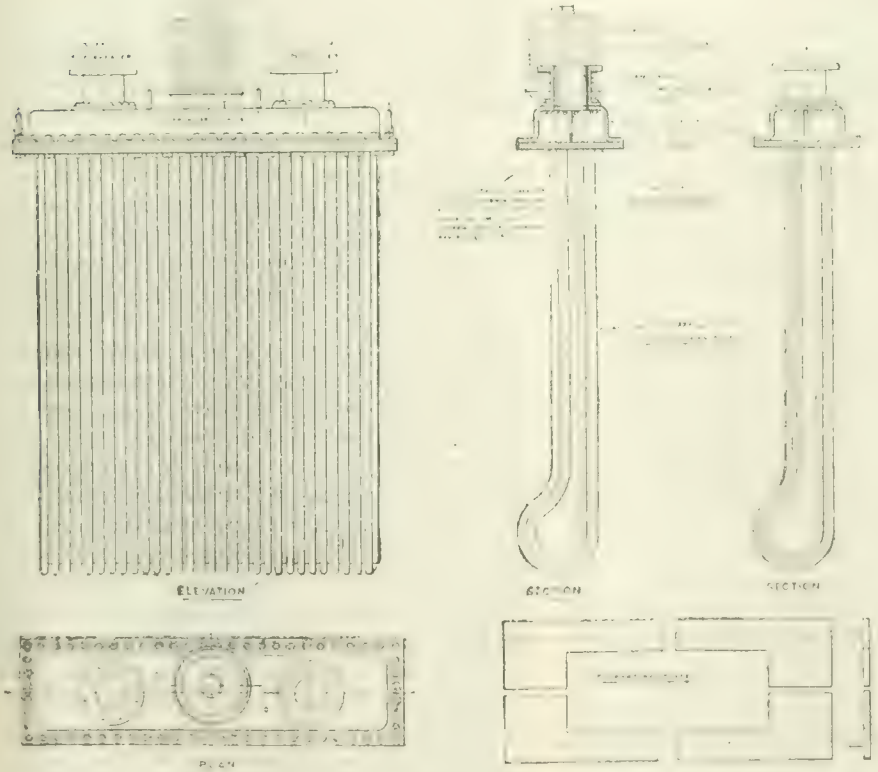


FIG. 6.—RECENT DESIGNS OF WROUGHT STEEL STEAM SUPERHEATERS BY MESSRS. MCPHAIL AND SIMPSON.

McPHAIL AND SIMPSON

[illegible] this firm's superheating systems [illegible] omies under varied conditions. [illegible] designs of wrought-steel superheater are illustrated in detail.

[illegible] cross-section and plan. The heating surface of this superheater is 310 square feet, but it can be increased to 500 square feet, and with dished double headers to 1,000 square feet.

In [illegible] of superheaters as supplied to the Admiralty. These superheaters are made entirely of solid drawn steel with the exception of the plates, which the superheater tubes pass through. These plates, which are of crucible steel, are only partially annealed, so that when exposed to the high temperature of the flue gases they may further anneal. They are, however, never in a temperature sufficiently high to complete the annealing or to burn or otherwise destroy them. The headers are also of solid drawn steel with flanges riveted on

ELECTRICITY AND POWER ENGINEERING.

By W. B. Esson, M.Inst.C.E., M.I.E.E.

(*Continued from page* 808.)

STEEL POLE CONSTRUCTION.

There is no hard and fast rule for pressure to be used, but 1,000 volts per mile was recognised as good practice. This was subject to limitation on the one hand by the highest pressure of which we had commercial experience, and on the other hand by the condition that the current in any wire should not be excessive, a point which had just been dealt with. According to Mr. C. F. Scott, a distance in miles equal to three times the number of thousands of volts might be covered without incurring an excessive annual charge per horse-power for copper. This meant that 5,000 volts would cover 15 miles, 10,000 volts 30 miles, and 20,000 volts 60 miles. That 10,000 volts had reached 28 miles and 30,000 volts 92 miles was shown by the installations at work. But the solution to all engineering problems lay in compromise, and the pressure was eventually settled by striking a balance between the cost and the risks undertaken.

In this country the necessity for a higher pressure than 20,000 volts was unlikely to arise, at least for some considerable time. Until recently wooden poles only had been used, but it was evident that iron and steel, being many times stronger than wood and capable of economical disposition with regard to the strains, properly designed structures of this material would enable spans to be greatly increased. Such structures had been used in special cases, and where long spans were necessary for crossing rivers or spanning ravines, but there was a growing tendency to employ for high pressures a steel pole construction with the spans made intentionally long, so as to reduce the number of points of support. The number of insulators was, of course, reduced to correspond with the increased spans, and it was argued that a construction of this kind by diminishing these weak points gave a line less liable to interruption than one in which wood poles were used. Steel poles certainly gave a construction more in accordance with engineering ideas and though the bulk of the work might be still carried out in wood, it was probable that for main lines, whenever the magnitude of the enterprise justified the larger investment, the more solid and permanent construction would be employed. A good example of steel construction was presented by the line of the Guanajuato Power and Electric Company, in Mexico. In that case steel towers, twelve to the mile, were used instead of wood poles, which were generally spaced forty to the mile. In Italy iron pole work had been developed to a considerable extent. After Paderno, which was the first line to adopt an all-iron construction, the Cenischia line was erected with a similar design of pole and with spans up to 260 ft. Then came the Brembo line, with specially constructed spans up to 920 ft., to transmit the power over the mountains Mr. Semenza, who had done a large amount of important work in connection with this subject, had stated that amongst others at present under construction were two new lines with spans of 360 ft., one of them to carry six wires; the other to carry twelve. The first iron poles were unnecessarily heavy, and had equal stiffness across the line and parallel to the line. Mr. Semenza has quite rightly contended that as in a straight line with equal spans the only strain to be borne by the line was exerted by the wind, it was unnecessary to employ poles of equal resistance in all directions, and he had accordingly designed a pole which presented great resistance in the direction of the wind, but low resistance in the direction of the line. This pole was elastic, and could deflect over 16 in. without exceeding the limit of elasticity, the consequence being that, if one or two of the wires gave way, the two nearest poles would bend, which would relieve the strain on the spans following, so that as a whole the line would stand, and no damage be done to the supports. The two new lines mentioned above as under construction had poles of this kind as well as the Brembo line.

Turbine construction had been largely influenced by electric power development, and the turbo-generator this year attained its majority. There were now 600,000 h.p. of turbines of the Parson's type at work. The turbine was being recognised as the simplest and best form of steam engine for alternator driving, when the generator output was over 1,000 kilowatts. The perfection of the high-speed engine was also the result of the requirements of electrical engineers, and influence of electricity on the design of gas engines had been most marked. Already gas engines of over 2,500 h.p. had been constructed for electrical work, and designs were stated to have been completed for the 5,000 h.p. size. Undoubtedly engines using gas produced fom cheap bituminous coal would figure largely in the electric power station of the future.

Abstract of presidential address at the opening meeting of the Civil and Mechanical Engineers' Society.

SHIPBUILDING NOTES.

CONTRASTED with those for a year ago the shipbuilding returns compiled by Lloyd's Register show a considerable increase in shipbuilding activities. At the Tyne, the Wear, West Hartlepool, and the Tees, there are now about 104,000 tons more steamships in course of construction than there were a year ago. At the same time the activity is relatively greater on the Clyde.

The steamship *Inkosi*, of Messrs. John T. Rennie Son and Co.'s Aberdeen Line, which sailed on Monday for Durban, Delagoa Bay, and East African ports, was fitted with the Marconi system of wireless telegraphy, and the steamship *Inanda*, of the same line, will be similarly fitted before she leaves on her next trip on the 7th prox. These are the first passenger steamers going into southern latitudes to be so fitted.

The steel screw trawler *Concord* was launched on Saturday from the yard of Messrs. Cochrane and Sons, Selby. Her principal dimensions are 120 ft. 7½ in. by 21 ft. 9 in. by 11 ft. 9 in. depth of hold. The vessel has been built to the order of Messrs. White and Willows, of Grimsby, and will be fitted with powerful triple-expansion engines by Messrs. C. D. Holmes and Co., of Hull.

On Saturday the new steel screw-steamer, *Norfolk Range*, recently launched by Irvine's Shipbuilding and Dry Docks Company, Ltd., West Hartlepool, proceeded to sea for her trial trip. She is of the following dimensions: 336 ft. by 47 ft. by 24 ft. 1 in. A double bottom is fitted throughout on the cellular principle and the fore and after tanks are arranged as trimming tanks. Five water-tight bulkheads divide the holds into six water-tight compartments and wood-grain divisions are fitted in the holds. A powerful quick-warping steam windlass is fitted forward for the working of the cables and steam steering gear is fitted amidships with hand-screw gear aft. Engines of the triple-expansion type have been supplied, and fitted by Messrs. Richardsons, Westgarth and Co., Ltd., having cylinders 24 in., 38 in. and 64 in. by 42 in. Two large S.E. boilers 160 lb. pressure. After the trial trip the vessel proceeded to Alexandria.

On Monday there was launched from the yard of the Tyne Iron Shipbuilding Company, Ltd., of Willington Quay-on-Tyne, a steel screw-steamer built to the order of Messrs. John Black and Co., of Glasgow, and of the following dimensions: Length, 331 ft. [illegible] and to class 100 A1 at Lloyd's, on the single-decked rule. The engines, which are to be supplied by Messrs. North-Eastern Marine Engineering Company, Ltd., of Wallsend-on-Tyne, are of the triple-expansion type, having cylinders 24 in., 40 in., and 66 in. by 42 in. stroke and working at a pressure of [illegible]. On leaving the ways the vessel was named the *Kelvinhead* by Miss Arrol, of Darlington.

Messrs. Swan, Hunter and Wigham Richardson, Ltd., launched on Thursday, the s.s *Scrula*, which they are building to the order of the Cork Steam Ship Company, Ltd., of Cork, for their trade between Liverpool and Dutch and Belgian ports. The engines are of the triple-expansion type and are being constructed by Swan, Hunter and Wigham Richardson, Ltd., at their Neptune Works.

The *Clan Macrae*, a large steel-screw [illegible], built to the order of the "Clan" line, was launched on Friday. She is over 400 ft. in length, of the three-deck type with two steel decks laid all fore and aft and takes Lloyd's highest class. She has a total capacity of 431,718 cubic feet, cellular double bottom all fore and aft for water ballast and a specially strengthened deep tank immediately forward of the engine room, the after peak also being available as a tank. The vessel is divided into eight watertight compartments. She has five large hatchways, ten powerful steam winches, large multitubular donkey boiler, twelve derricks, powerful windlass, patent steam steering gear fitted under the bridge, girders and wide spaced pillars in holds in lieu of stanchions. Special attention has been paid to the arrangement of derricks to enable cargo to be discharged with rapidity and one thirty-ton derrick is fitted to deal with heavy weights. The vessel will be lighted throughout with electricity by the builders and fitted up as a first-class modern cargo boat. She will be rigged as a two-masted fore and aft schooner with telescopic masts to suit the canal bridges. Triple-expansion engines will be supplied by Messrs. Richardsons, Westgarth and Co., Ltd., Hartlepool, with cylinders 27 in., 43 in., 71 in. by 48 in. [illegible] and two boilers 16 ft. 2 in. by 11 ft. 9 in. and 200 lb. working pressure fitted with Howden's [illegible] draught.

A large turret steamer the *Belt of England* the latest addition to Messrs. Crow, Rudolf and Co.'s fleet was launched by Messrs. William Doxford and Sons, Ltd., of Pallion on the 29th ult. The length of this vessel is 352 ft., breadth 48 ft.; moulded depth, 26 ft. The total weight of cargo and bunkers carried is 7,300 tons, and a powerful output of deck machinery has been provided for rapidly discharging the cargo. The engines, with cylinders 26 in., 42 in., and 68 in., and a stroke of 42 in., and the two single-ended boilers of 160 lb. pressure, have also been supplied by the builders. Built to Lloyd's requirements, the vessel has received their 100 A1 classification.

On the same date there was launched from the yard of the Northumberland Shipbuilding Company, Ltd., Howden-on-Tyne, a steamer built to the order of Messrs. Furness, Withy and Co., Ltd., West Hartlepool. The vessel is 360 ft. long by 48 ft. beam by 30 ft. 10 in. deep, and has been built under special survey to the highest class at British Corporation. She is fitted with long poop, long bridge, topgallant forecastle. Special attention has been paid to the loading and discharging gear, and a complete outfit for the rapid handling of cargoes is being arranged for, consisting of eight steam winches by Messrs. John Lynn and Co., Sunderland, a large number of cargo derricks, steam steering gear by Messrs. Hastie and Co., Greenock, and steam windlass by Messrs. Emerson, Walker and Thompson Bros. The machinery, consisting of engines with cylinders 25 in., 41 in., and 69 in. by 46 in., three large steel boilers 14 ft. by 10 ft. 9 in., 180 lb. working pressure, will be supplied by Messrs. Richardsons, Westgarth and Co., Ltd., Sunderland.

On Thursday, the 28th ult., Messrs. Harland and Wolff, launched the large steel twin-screw steamer *New Amsterdam* from the north end of the Queen's Island. The new steamer, the gross tonnage of which is about 17,100 tons, has been built to the order of the Holland-America Line to trade between Rotterdam and New York. The machinery for the vessel, which will be of Messrs. Harland and Wolff's latest type, is being constructed by them in their engine works at Abercorn Basin, Belfast.

Messrs. Ropner and Son, Stockton-on-Tees, recently launched from their shipbuilding yard, a steel screw steamer: length, 414 ft.; breadth, 52 ft.; depth, 34 ft.; with a deadweight capacity of about 8,500 tons. The machinery has been supplied by Messrs. Blair and Co., Ltd., of Stockton-on Tees. The owners of the vessel are Messrs. R. Chapman and Son, Newcastle. She received the name of *Carlton*.

CORRESPONDENCE.

To the Editor of Page's Weekly.

Sir,—It is a painful fact, if not a strange one that the day after I returned you the proof of the appreciation of that great English engineer—the late Charles Brown—I should receive as a personal friend of nearly twenty years' standing, the intimation from the family of his death.

He wrote me a little over a fortnight ago correcting some of the notes *re* incidents in his life work, and deprecating with all his natural modesty the eulogy of the appreciation, admitting, however, that "such an appreciation from a colleague was most refreshing."

In this letter he replies to the suggestion I made to him that he should, like the late Von Siemens, give the engineering world the benefit of an autobiography, with all the valuable lessons culled from often dearly-bought experience of a life's work pregnant with incidents in creating and pioneering epoch-making engineering developments.

He objected to writing such an autobiography because—he wrote—"it seems like writing one's own epitaph." Strange that so soon after writing this it becomes a devoir of a devoted family to write the sculptured epitaph over the cremated remains of this great engineer, whose life work was principally done in the last century, but who was still keenly alive to the nature of the developments that may follow in the new century.

The final part of his letter I will report verbatim. The message it contains, coming as it does from one of the most resourceful and ingenious mechanical engineers since the days of James Watt, is worthy of our respect.

He writes: "What is wanted is a gas turbine, but, so far, the results of experiments in this line are not encouraging. It will be found one day (but I have no idea on what lines), for we are now in the age of rotary machinery. The last century was the century of reciprocating machinery."

He confirms, incidentally, the importance of the fact that low thermal value gas such as blast-furnace gas is essential for the satisfactory working of large capacity internal combustion engines.

I have, however, already shown in Page's Weekly that the fact of high initial compression being necessary to secure ignition, sensitiveness with this gas constitutes the [illegible] the way of gas turbine progress.

Sincerely yours,

B. H. Thwaite.

CONTRACTORS' NEWS.

We shall be pleased to insert under this column, free of charge, particulars of open contracts.

CONTRACTS OPEN.

	Last Day
Edinburgh. Electric light installation at Drummond Street Public School, for the Edinburgh School Board. Mr. Carrrae, architect, 3, Queen Street	Oct. 23
Cowpen.—Laying and jointing about 1,340 lineal yards of 9-in. cast-iron water main in Waterloo, for the Cowpen Urban District Council. Mr. Robert Grieves, engineer and surveyor, Seaforth Street, Waterloo, Blyth	Oct. 23
London.—Construction and delivery, f.o.b., at an English port, of two steel bell buoys, for the Corporation of Trinity House, London, E.C. Mr. A. Owen, secretary, Trinity House, E.C	Oct. 23
Edinburgh. Supply of (1) arc lamps, (2) arc lamp-posts to the City authorities. Electrical Engineer, Dewar Place, Edinburgh	Oct. 23
Ruabon.—Driving and securing a tunnel 500 to 600 yards long, 6 ft. by 4 ft. in the clear, for the United Westminster and Wrexham Collieries. Mr. William Edwards, Engineer's Offices, Ruabon ...	Oct. 24
Birmingham.—Supply and delivery of 2,000 tons of 7-in. tramway rails, British standard, section No. 4, with all necessary fishplates for same, for the Public Works Committee, City Surveyor's Office ...	Oct. 25
Bacup (Lancs).—Supply of cast-iron pipes varying from 6 in. to 15 in. diameter, for the Corporation. Messrs. James Diggle and Son, civil engineers, 14, Victoria Street, Westminster, S.W.	Oct. 25
Manchester.—Reconstruction of a portion of Hulme Street Tunnel, for the Improvement and Buildings Committee. City Surveyor's office, Town Hall, Manchester	Oct. 25
Falmouth.—Improvements to the eastern pier head at Falmouth Docks. Mr. Fred. J. Bowles, Falmouth Docks ...	Oct. 31
Dublin.—The Dublin, Wicklow, and Wexford Railway Company invite tenders for the supply of 1,000 tons bullhead steel rails (85 lb. per lineal yard), with corresponding fishplates; also for the supply of 650 tons bullhead cast-iron chairs. M. F. Keogh, secretary	Oct. 25
Hornsea (Yorks).—Supply of 900 yards 6 in. cast-iron water-mains, for the Hornsea Urban District Council. Mr. W. E. Warburton, surveyor, Public Rooms, Hornsea	Nov. 1
London, S.W.—Supply and delivery of about 1,000 tons of steel conductor tee rails, required in connection with the reconstruction for electrical traction on the conduit system of certain of the Council's tramways north of the Thames, for the London County Council. The rails must be made by the acid process. Engineer's Department, County Hall, Spring Gardens, S.W.	Oct. 31
Bridlington.—Supply, delivery, erection and connecting-up of one 200 k.w. dynamo, with the necessary extensions to pipe-work and connections to switchboard. Mr. A. J. Beckett, Borough Electrical Engineer, Electricity Works, Quay Road, Bridlington	Nov. 1
Tynemouth.—The supply and erection at the electricity works, Tanners' Bank, North Shields, of one 165 k.w. traction dynamo, for the Corporation. Mr. C. Turnbull, Electricity Works, North Shields	Nov. 2
Edinburgh. — Installation of intercommunication telephone system throughout the offices, Castle Terrace, Edinburgh, for the Edinburgh Parish Council. Mr. R. M. Cameron, architect, 53, Great King Street, Edinburgh	Nov. 7
Stratton St. Margaret (Wilts).—Construction of a storm-water bed at their outfall works, in the parish of Stratton St. Margaret, and incidental works, for the Highworth Rural District Council, the whole to be let in one contract. Messrs. Beesley, Son, and Nichols, 1, Victoria Street, Westminster, S.W.	Nov. 8
Bradford.—For heating by atmospheric steam the Royal Infirmary, Bradford Mr. Fred Holland, engineer and architect, 11, Parkinson's Chambers, Hustlergate, Bradford	Nov. 18
Waterford. Supply and erection of a three-lift holder, for the City of Waterford Gas Company. Mr. R. Bruce Anderson, 5, Westminster Chambers, Victoria Street, London, S.W.	

COMING CONTRACTS.

Woolwich. The Borough Council have received sanction from the L.C.C. to borrow sums of £16,275 and £10,223 for electric supply purposes.

Islington.—The London County Council have sanctioned the borrowing of £13,000 by the Borough Council for electric supply purposes.

Hereford. The Town Council have decided on a large extension of the electric lighting, and a sum of £5,300 is to be borrowed for carrying out the work.

Aston Manor.—A Local Government Board inquiry conducted by Mr. H. Ross Hooper, M.A., M.Inst.C.E., was held last week in reference to an application of the corporation for sanction to borrow £50,000 for electricity purposes.

Hambledon.—A Local Government Board inquiry has been held recently at Hambledon concerning an application of the Hambledon Rural District Council for sanction to borrow £10,000 for works of water supply for the parish of Haslemere, including works to be constructed within the parish of Lurgashall, in the rural district of Midhurst.

St. Pancras (London). — The Electricity Committee have reported to the Council that the electrical engineer estimates the cost of extending the arc lighting to 26 thoroughfares at £8,250. On Wednesday the Council sanctioned the carrying out of the work.

CONTRACTS CLOSED.

Purfleet.—The Kennicott Water Softener Company 29, Great St. Helen's, E.C., announce that they have received an order from the Thames Paper Company, Purfleet, Essex, for one of their type "A" Kennicott water-softeners, of a capacity of 10,000 gallons per hour.

Immingham. The contract for the construction of the proposed deep water dock on the Humber at Immingham, near Grimsby, has been secured by Messrs. Price, Willows, and Reeves, the constructors of the Barry Docks, the Heysham Docks, and the Portsmouth Harbour Works. It is stated that the amount of the tender was over one million pounds, and that the works are to be completed within four years. The construction of the dock, which will be the largest on the east coast, begins next February.

India.—An order has been placed with Messrs. Kitson and Co., of Leeds, for 20 completed locomotives for the Indian State railways, in addition to 25 boilers for other engines.

London.—The Brush Electrical Engineering Company report the following contracts: Mansfield Light Railway (per J. G. White and Co.), one watering and rail cleaning car; Victoria Jubilee Technical Institute, Bombay, 80-k.w. dynamo for educational and general purposes, and W. Baird and Co., electric coal cutter.

Bengal. — Messrs. William Simons and Co. Ltd., Renfrew, have received an order to construct a powerful suction pump dredger of large dimensions for the Presidency of Bengal.

Suez Canal.—Messrs. Lobnitz and Co., have booked an order for five twin-screw hopper barges for the Suez Canal proprietary, for whom the firm have already built a large number of barges and several powerful dredgers.

Shanghai.—Messrs. Bruce, Peebles, and Co., Ltd., have secured a contract for 30 miles of track and 100 electric tramcars for the Shanghai tramways. The total value of the contract is £377,000.

Japan.—Messrs. Brownlie and Murray, Ltd., have received an order for large steel-framed buildings for some new works in Japan.

Brighton.—The Town Council have accepted the tender of the British Westinghouse Company for the supply of cast-iron facias for the switchboards at the Southwick power station and the North Road works, and that of the Chloride Electrical Storage Company, Ltd., for a battery booster.

Dewsbury.—The Town Council have accepted the tender of the Phœnix Dynamo Company, of Bradford, for the supply of a booster for the electric light station.

Leeds.—The Corporation have accepted the tender of the Horsfall Destructor Company, Ltd., for the supply of two cells of Horsfall's patent "tub-fed" type at the Beckett Street Destructor, at £2,419.

Reddish.—Messrs. J. E. H. Andrew and Co., Ltd., have recently received the following order for large power gas engines: Messrs. Brooks and Doxey, Ltd., six engines each of 120 b.h.p. together with a Mond gas plant, for driving their own works. The Coalbrookdale Company, Ltd., two double cylinder type engines each of 210 b.h.p. for driving alternators for their own works. The Manchester Corporation for their sewerage works at Withington, one engine and suction gas plant of 90 b.h.p. Messrs. Ogston and Tennant, Ltd., two engines and one suction gas plant of 140 b.h.p. Messrs. A. Muirhead and Sons, two engines and suction gas plants of 120 b.h.p. Messrs. Cox and Company, engineers and shipbuilders, Falmouth, one engine and suction gas plant of 120 b.h.p. The Co-operative Wholesale Society, Ltd., one double cylinder engine of 280 b.h.p.

APPOINTMENTS FILLED.

Battersea.—The governing body of the Battersea Polytechnic have appointed Mr. J. Davidson, A.R.C.S. (Ireland), to the post of assistant in mechanical engineering for drawing-office classes in the Battersea Polytechnic.

Bournemouth—The Town Council have appointed M. H. G. Andrews as assistant electrical engineer and Mr. J. H. Chick as shift engineer.

Brighton.—Mr. Henderson of Brighton Corporation electricity department, has been appointed instructor in electric wiring at the Brighton Municipal School of Science and Technology.

Limerick. Mr. John J. Guyan, of Cork electric power station, has been appointed junior assistant at Limerick Municipal Electricity Works.

Manchester.—Mr. A. G. Livesay, assistant electrical engineer to the Leeds Corporation tramway department, has secured an appointment under the British Westinghouse Company at Manchester.

Ravensthorpe.—The Ravensthorpe Urban District Council has retained the services of Mr. Mountain, of Huddersfield, as electrical engineer, for two years.

Wallasey.—Mr. H. Eustace Saver has taken up the position of engineer-in-charge in the Wallasey Urban District Council Electric Supply Works at Liscard.

Share List of Engineering, Electrical, Iron and Steel, and other Companies.

The following is a comprehensive list of Companies in the industries covered by "Page's Weekly," in which shares business is being currently transacted. Additions will be made from time to time as occasion requires. We desire it to be understood that while our Share List will generally be found correct, we do not hold ourselves responsible for any loss or inconvenience that may arise from possible inaccuracies

STOCK EXCHANGE SETTLING DAYS.—Settling days on the Stock Exchange are as follows :—
Consols Nov 2nd. General Settlements : October 27th, Nov 15th Bank Rate, September 28th, 1905, 4 per cent

I.—ENGINEERING, IRON, AND STEEL COMPANIES.

Present Amount described	Shares	Last Dividend	Name	Paid up	Closing Prices
11,270	5	5	Addays & Onions Pneumatic Engineering, Ltd.	3	2¼ — 2½
10,000	5	3½	Do. Cum. Pref. 6 per cent.	5	4½ — 5
3,210,000	1	1	Armstrong (Sir W. G.), Whitworth and Co., Ltd.	1	3⅝ — 3¾
76,970	5	2/-	Do. 4% Cum. Pref.	5	5½ — 5
1,500,000	100	4	Do. 4% 1st Mort. Dbs. Rd.	100	103 — 105
£100,000	100	4½	Aveling and Porter, Ltd., 4½% Reg Mt. Debs. Red.	100	90 — 99
530,000	1	1/1	Babcock and Wilcox, Ltd., Ord.	1	3⅜ — 4
100,000	1	7½d.	Do. 6% Cum. Pref.	1	1⅛ — 1¼
20,000	5	3	Baker (Joseph) and Sons, Ltd. 6% Cum. Pref.	5	4 — 5
270,000	1	6¾d.	Baldwins, Ltd., 5½% Cum. Pref.	1	1⅛ — 1⅜
£250,000	Stk	4½	Do. 1st Mt. 4½% Deb. Stk. Red.	100	103 — 104
150,000	4½	2/6	Barrow Hæmatite Steel Co., Ld., O	4½	1⅜ — 1½
50,000	4½	3	Do. do. Cum 2nd. Pref.	4½	4⅛ — 4⅜
33,334	5	2/6	Bayliss, Jones and Bayliss, Ltd., 5% Cum. Pref. Shares	5	4¾ — 5¼
£500,000	100	4½	Beardmore (Wm.) & Co., Ltd. 4½% 1st Mt. Debs., Red., Scrip 50% pd	-	104 — 108½
50,000	10	6	Bell Brothers, Ltd., 6% Cum. Pref.	10	12½ — 12¾
£100,000	Stk	4½	Do 4% Deb. Stock, Red.	100	100 — 102
200,000	1	1/-	Beyer, Peacock and Co., Ltd., Ord.	1	⅝ — ¾
300,000	1	6d.	Do. 5½% Cum Pref.	1	⅜ — ½
£300,000	Stk	4½	Do. 4½% Red. Deb. Stock	100	93 — 96
1,629,760	1	6d.	Bolckow, Vaughan and Co., Ltd., O. Nos. 1-1,629,760	1	1⅛ — 1⅜
1,860,900	1	3½d.	Do. Nos. 1,639,101-2,500,000	12/-	½ — ¾
1,160,000	1	10½d.	Brown (John) and Co., Lim., Ord., Nos. 1-1,160,000	15/-	1⅝ — 1⅞
500,000	1	1/2	Do. Ord., Nos. 1,160,001-1,750,000	1	1¼ — 2
74,000	10	5/-	Do. 5% Cum. Pref.	10	11¼ — 11½
154,500	5	2/6	Cammell, Laird & Co., Ltd., Ord.	5	10 — 10½
212,500	5	2/6	Do. 5% Cum. Pref.	5	5⅜ — 5½
450,000	1	1/2½	Clayton & Shuttleworth, Ltd., Ord.	1	1 — 1¼
70,000	5	2/6	Do. 5% Cum. Pref.	5	5⅜ — 5½
£250,000	Stk	4/-	Do 4% 1st Mort Db. Stk. Red	100	100 — 102
100,000	10	30/-	Consett Iron Co., Ltd., Ord.	7½	36¾ — 37½
57 031	10	10/-	Crossley, Bros., Ld., Ord. 40340/97370	10	15¾ — 15
40,339	10	5/-	Do 5% Cum Pref.	10	11 — 11½
75,000	1	2/6	Delta Metal, Ltd. Shares	1	2¼ — 2½
1,250,594	1	3½d.	Dorman, Long & Co., Ltd.	1	⅞ — 1
£400,000	Stk	4/-	Do. 4% 1st Mort. Perp. Deb. Stk	100	90 — 94
200,000	5	8/-	Dunderland Iron Ore Co., Ltd., 6% Cum. Pref. and Participating	5	4½ — 4¾
250,000	1	9½d.	Dunlop (James) & Co., Ltd., Ord.	1	⅞ — 1
300,000	1	7½d.	Do. 6% Cum. Pref.	1	¾ — 1
4,721	13	13	Ebbw Vale Steel, Iron & Coal Co., Ltd.	13	10½ — 11½
60,754	13	10/-	Do. do. do.	10	9 — 9½
39,250	10	8/-	Elliott's Metal, Ltd.	8	5¼ — 5½
5,000	10	5/-	Do. Cum. Pref. 5%	10	8½ — 9½
186,748	Stk	4	Do. Deb. 4%	100	90 — 94
25,000	10	6/-	Fairfield Shipbuilding & Engng. Co., Ltd., 6% Cum. Pref.	10	11¼ — 12½
£250,000	Stk	4½	Do. 4½% Mort. Deb. Stk. Red.	100	100 — 103
9,000	10	10%	Fleming & Ferguson, Ltd., Ord Nos. 1,9000	10½	12¾ — 12¾
6,000	10	5/-	Do. 5% Cum. Pref. Nos. 9001/15000	10	10 — 10½
126,000	3	3/-	Fraser & Chalmers, Ltd., Ord.	3	3⅜ — 3½
21,000	3	1/6	Do. 7½% Cum. Pref.	3	5¾ — 6
10 000	10	5/-	Galloways, Ltd., 5% Cum. Pref. 18001/28000	10	7 — 8
£150,000	Stk	4/-	Do. 4% 1st Mort. Deb Red.	100	88½ — 89½
16,800	10	16/-	Greenwood & Batley, Ltd., Ord.	10	6¾ — 7¾
9,600	10	7½	Do. 7½ Cum. Pref.	10	10¼ 11
965,000	1	1/-	Guest, Keen & Nettlefolds, Ltd. Ord.	1	2⅜ 2⅝
344,000	5	2/6	Do. 5% Cum. Pref.	5	6 — 6½
£1,850,500	Stk	4½	Do. 4% Irred. Mort. Deb. Stk	100	106 — 108
13,000	5	2/6	Gwynnes, Ltd., 5% Cum. Pref.	5	2 — 3
250,000	1	1/-	Hadfield's Steel Foundry Co., Ld., Ord.	1	3⅜ — 4
20,000	10	4/6	Do. 4½% Cum. Pref.	10	10½ — 11
30,000	5	3/-	Hall (J. & E.), Ltd. 6% Cum. Pref.	5	5 — 5½
408,505	1	1/6	Harvey United Steel Co., Ltd.	1	1⅜ — 1⅝
47,500	10	7½	Hawthorn, Leslie & Co., Ltd. Ord.	10	15 — 15½
28,001	5	7/-	Head, Wrightson & Co., Ltd.	5	5 — 5¼
85,000	1	7½d.	Hill (Richard) & Co. (1899), Ltd., Ord.	1	¾ — 1
18,000	5	3/-	Do. 6% Cum. Pref.	5	4½ — 5⅛
£100,000	Stk	6½	Hornsby (Richard) & Sons, Ld., Ord. 6% Cum. Pref.	100	101 — 103

ENGINEERING, IRON, AND STEEL COMPANIES. *Contd.*

Present Amount Subscribed	Shares	Last Dividend	Name	Paid up	Closing Prices
750,000	1	7½	Howard & Bullough, Ltd., Ord.	1	1⅛ — 1⅜
2,500	10	6½	Do. 6% Pref. Non-Cumu.	10	12½ — 13½
£250,000	Stk	4	Do. 4% Deb. Stk., Red. after 1905	100	96 — 99
37,500	10	20	Kynoch, Ltd.	10	17 — 17½
12,537	10	7	Do. Cum. Pref. 5%	10	10½ — 10¾
300,000	1	4½d.	Lambert Bros., Ltd., Ord.	1	¾ — ⅞
50,000	5	2/9	Do. 5½% Cum. Pref.	5	4 — 4½
10,000	3	2/11½	Leeds Forge Co., 7% Cum. Pref.	3	3½ — 4
200,000	1	7½d	Lysaght (John), Ltd., 6% Cum. Pf.	1	1⅛ — 1⅜
£300,000	Stk	4½	Do 4½% 1st Mt. Deb. Stk., Red.	100	108 — 110
40,000	10	5	Mather & Platt, Ld., 5% Cum. Pref	10	11½ — 11¾
210,000	1	Nil.	Measures Bros., Ltd., Ord.	1	⅛ — ¼
75,000	1	6d.	Do. 5½ Cum. Pref.	1	⅜ — ½
£75,000	Stk	4½	Do. 4½% 1st Mrt. Db. Stk., Red.	100	96 — 99
21,943	5	2/6	Muntz Metal, Ltd.	5	4½ — 5
14,248	5	5	Do. Pref. 5%	5	4½ — 5¼
5,000	62½	47/6	Nantyglo and Blaina Iron Works, Ltd., 8% Cum. Pref.	62½	79 — 81
73,000	10	5/-	N. Brit. Loco. Co., Ltd., 5% Cm. Pf.	10	12¾ — 12¾
80,000	5		North-Eastern Steel Co., Ltd.,		
£250,000	Stk	4½	4½ 1st Mrt. Db. Stk., Red	100	89 — 93
122,000	5	1/6	Pearson & Knowles Coal and Iron Co., Ltd., Ord., "B"	5	5⅛ — 5⅜
50,000	5	2/-	Do. 6% Cum. Pref. "A"	5	6 — 6¼
70,000	10	10/-	Pease & Partners, Ltd., Ord.	10	11¾ — 12¼
£400,000	Stk	4	Do. 4% Perp. Deb. Stock	100	100 — 103
20,000	5	3/-	Peebles (Bruce) & Co., Ld., 6% Cm. P.	5	4¾ — 5¼
65,000	1	- -	Pooley (Henry) & Son, Ltd., Ord.	1	11 — 12
13,000	5		Do. 5½% Cum. Pref.	5	4¾ — 4¾
230,000	1		Projectile Co. (1902), Ltd., Ord.	1	⅜ — ½
126,948	5	2/-	Rhymney Iron Co., Ltd.	5	2 — 2¼
73,662	5	2/-	Do. New	5	1¾ — 2
£330,000	—	5½	Do. 5% Mort. Deb., Red.	100	102 — 104
350,000	1	7½d.	Richardsons, Westgarth & Co., Ltd., Ord. 350,001—700,000	1	⅝ — 1½
1570,000	1	7½	Do. 6% Cum. Pref.	1	1 — 1⅛
£350,000	Stk	4½	Do. 4½% Perp. Deb. Stock	100	97 — 100
35,000	10	12	Ruston, Proctor & Co., Ltd.	10	10¾ — 10½
275 000	1	6d.	Scott (Walter) Ltd., Ord.	1	1⅝ — 1¾
300,000	1	7½d.	Do. 6% Cum. Pref.	1	⅞ — 1
£300,000	Stk	4%	Do. 4% Perp. Deb. Stk.	100	94 — 97
£115,300	100	5/-	Shelton Iron, Steel and Coal Co., Ltd. 1st Charge 5% Debs. Red.	100	93 — 96
£97,900	100	6%	Do. 6% 2nd Mort. Debs., Red.	100	95 — 99
250 000	1	1/-	South Durham Steel & Iron, Ltd. Or.	1	1¼ 12
300,000	1	1/2½	Do. 6% Cum. Pref.	1	1⅝ — 1¾
£300,000	Stk	4½	Do. 4½% Perp. Deb. Stock	100	93 — 96
49,560	10	2½	Steel Co. of Scotland Ord. 1/49560	9	7½ — 8
£125,240	Stk	5	Do. 5% Trust Mort. Deb	100	106 — 107
25,000	10		Stephenson (Robert) & Co., Ltd., Or.	10	2½ — 3
25,000	10	5/6	Do. 5½% Cum. Pref.	10	4½ — 4¾
£270,000	Stk	4%	Do. 4% Perp. Deb. Stock	100	80 — 83
85,000	10	9/-	Stewarts & Lloyds, Ltd., Ord.	10	19¾ 20
55,000	10	6/-	Do. 6% Cum. Pref.	10	14½ — 15
634,732	1	6d.	Swan, Hunter & Wigham-Richardson, Lim. Ord.	1	⅜ — ½
538,845	1	6d.	Do. 5% Cum. Pref.	1	1⅝ — 1⅞
£240,000	Stk	4½	Do. 4½% 1st Mort. Deb. Stk. Red	100	96 — 99
300,000	1	6d.	Thames Iron Works, Shipbuilding & Engineering Co., Ltd., 5% Cum. Pf.	1	⅝ — ¾
£200,000	100	4%	Do. 4% Irredeem. 1st Mort. Deb.	100	81 — 84
£148,500	1	7½d.	Thornycroft (John I.) & Co., Ltd. Or.	1	¾ — 1
£160,000	1	7½d.	Do. do. 6% Cum. Pref.	1	1 — 1⅛
10,000	10	5/-	Tyler (J.) & Sons, Ltd. 5% Cum Pf.	10	9½ — 9¾
$508,200,000	$100	$8	United States Steel Corp. Com. Stk.	$100	38½ — 39½
$67,344,100	$100	$1¼	Do. 7% Cum. Pref. Stock	$100	107½ — 107¾
$9,228,800	$1000	5%	Do. 10-60yr. 5% Skg. Fd. G. Bds.	$1000	98 — 100
3,350,000	1	1/-	Vickers, Sons & Maxim, Ltd. Ord.	1	2½ — 2¾
750,000	1	6d.	Do. 5% Non-Cum. Pref.	1	1⅜ — 1⅝
£750,000	Stk	5%	Do. 5% Non-Cum. Pref. Stock.	100	120 — 123
£1,250,000	Stk	4%	Do. 4% 1st Mort. Deb. Stk. Red.	100	104½ — 106½
£1,000,000	100	4½	Do. 4½% 2nd Mort. Debs., Red.	100	105 — 107
225,000	1	1/2½	Weardale Steel, Coal & Coke, Ltd., Def. Ord.	1	1⅛ — 1½
500,000	1	7½d	Do. 6% Cum. Pref. Ord.	1	1⅛ — 1⅜
£300,000	Stk	4%	Do. 4% Perpetua. Deb. Stock	100	87 — 90
7,687	5	2/9	Weldless Steel Tube, Ltd., Cum. Pref.	5	4½ — 4¾
300	Stk	4½	Do. Mort. Deb. 4½	100	92 — 98
66,666	5	3/-	Willans & Robinson, Ord.	5	1½ — 2
66,666	5	3/-	Do. 6% Cum. Pref.	5	2½ — 3½
£246,641	Stk	4%	Do. 4% 1st Mort. Deb. Stk. Red	100	74 — 79
£150,000	Stk	4½	Yorkshire Iron & Coal Co., Ltd., 4½% 1st Mort. Deb. Stk. Red.	100	74 — 76

Stocks and Shares marked * are quoted ex-dividend.

II.—ELECTRICAL MANUFACTURING COMPANIES.

Present Amount Subscribed	Shares	Last Dividend	Name	Paid up.	Closing Prices.
70,000	1	6d.	Alliance Elec. Co., Ltd. 5% Cum. Pf.	1	⅝— ⅞
125,000	1	7½d.	Aron Elec. Meter Ltd., 6% Cum. Pf.	1	⅞— 1
120,000	1	1.2½	Bell's Asbestos Co., Ltd.	1	1⅝—1⅞
140,000	5	9d	British Aluminium Co. 7% Cum Pref.	5	5 — 5⅛
£300,000	Stk	5%	Do 5% 1st Mort. Deb. Stk. Rd.	100	99 —103
100,000	5	4/-	British Insulated & Helsby Cables Ltd., Ord. ..	5	6½ — 7
100,000	5	3/-	Do. 6% Cum. Pref.	5	5½ - 6¼
£500,000	Stk	4½%	Do. 4½% 1st Mort. Deb. Stk. Rd.	100	103 —106
£200,000	Stk	4½%	British Thomson-Houston Co., Ltd., 4½% 1st Mort. Deb. Stk. Red. ..	100	98—100
400,000	5	3/-	British Westinghouse Electric and Manufac. Co., Ltd., 7% Pref. ..	5	2⅞ — 3⅛
£616,353	Stk	4%	Do. 4% Mort. Deb. Stk. Red...	100	85 — 89
105,731	2	2/-	Brush Elec. Enging. Co., Ltd., Ord..	2	½— ¾
150,000	2	2½%	Do. 6% Pref.	2	1½— 1⅝
£125,000	Stk	4½%	Do. 4½% Perp 1st Deb. Stk...	100	93 — 97
£125,000	Stk	4½%	Do. 4½% Perp. 2nd Deb. Stk.	100	78 — 81
35,000	5	7/6	Callender's Cable & Constn. Ltd. Ord.	5	10½— 11½
40,000	5	2/6	Do. 5% Cum. Pref.	5	5⅞ — 5⅞
£200,000	Stk	4½%	Do. 4½% 1st Mort. Deb Stk. Red.	100	109 111
85,000	3	1/6	Crompton & Co., Ltd...	3	1⅞ -1⅞
£100,000	—	5%	Do. 5% 1st Mort. Reg. Debs.	100	95—100⅝
52,000	5	10/-	Dick, Kerr & Co., Ltd., Ord. ..	5	8½— 9*
61,000	5	8 -	Do. 6% Cum. Pref.	5	6⅝— 6⅞
£300 000	Stk	4½%	Do. 4½% Deb. Stock, Red. ..	100	106 —108
233,334	1	6d.	Doulton & Co., Ltd., 5% Cum. Pref.	1	1⅛— 1⅜
£233,334	Stk	4%	Do. 1st Mort. 4% Iree. Deb. Stk.	100	107 —110
99,261	5	1 6	Edison and Swan United Electric Light, Ltd., "A" Shares Nos. 1-99,261	3	1⅜— 1*
17,139	5	2/6	Do. "A" Shares Nos. 01-017,139	5	2 — 2*
£344,023	Stk	4%	Do. 4% Deb. Stock Red. ..	100	85 — 90
£100,000	Stk	5%	Do. 5% Second Deb. Stk. Red.	100	93 — 97
112,100	2	1.7½	Electric Construction Co., Ltd. ..	2	⅝ - ¾
31,390	2	2.9⅜	Do. 7% Cumulative Pref. ..	2	1⅞— 2⅛
£200,000	Stk	4%	Do. 4% Perp. 1st Mt. Deb. Stk.	100	92 — 95
10,248	10	7/6	Evered and Co., Ltd...	10	10 — 12
25,000	10	5/-	Gen. Elect. Co. (1900), Ltd., 5% Cum. Pref.	10	9⅜— 10
£200,000	Stk	4%	Do. 4% 1st. Mt. Deb. Stk., Red.	100	96—100
35,000	5	5/-	Henley's (W. T.) Telegraph Works Co., Ltd., Ord.	5	12 —13
35,000	5	2/3	Do. 4½% Cum. Pref.	5	5⅛— 5⅜
£50 000	Stk	4½%	Do. 4½% Mt. Deb. Stk. Red.	100	109—111
50,000	10	5/-	India Rubber, Gutta Percha & Telegraph Works Co., Ltd.,	10	15½—16½
£300,000	100	4%	Do. 1st Mort. Deb. Red. ..	100	99 —102
7,500	10	—	Parker, Thos., Ltd.	10	6½— 7
100,000	1	3%	Scott (Ernest) & Mountain, Ld., Ord.	1	17/—17/6
37,950	12	12/-	Telegraph Construction and Maintenance Co., Ltd.	12	34 — 36
£150,000	100	4%	Do. 4% Deb. Bonds	100	102 - 104

III.—ELECTRIC TRACTION.

Present Amount Subscribed	Shares.	Last Dividend	Name	Paid up.	Closing Prices.
120,000	5	3/-	Anglo-Argentine Trams Co., Ld., Or.	5	8⅛—8⅜
260,007	5	2/6	Do. 5% Cum Pf.	5	5½— 6⅛
£230,000	Stk	6%	Do. Permanent 6% Debenture Stock, 1888 ..	100	141 —144
20,000	10	12/-	Barcelona Trams Co., Ltd., Ord. ..	10	13¾— 14½
10,000	10	5/-	Do. 5% Cum Pf. Shares	10	9½— 10
£46,800	100	6%	Do. 5% Debs., Red. ..	100	98 —101
£191,326	Stk	4½%	Do. 4½% Red. Deb. Stk.	100	97 —102
75,606	1	—	Bath Elec. Trams. Ld., Pf. Or. ..	1	¾ — 1
59,394	1	11·1d	Do. 5% Cum. Pf. ..	1	⅞—1⅛
75,000	5	—	Brisbane Electric Tram Investment Co., Ltd., Ord.	5	1 — 1½
75,000	5	2/6	Do. 5% Cum. Pf. ..	5	3¾— 4¼
£425 000	Stk	4½%	Do. 4½% 1st Deb. Stk., Red.	100	95 — 98
£200,000	Stk	6%	Brit. Columbia Elec. Rly. Co., Ltd., Def. Ord. Stock	100	126—129
		5%	Pref. Ord. Stock	100	109—112
133,301	10	6/-	Brit. Electric Traction, Ltd., Ord.	10	9⅛ — 9⅝
156,437	10	6/-	Do. 6% Cum. Pref.	10	11 —11½
£1,000,000	Stk	5%	Do. 5% Perp. Deb. Stk. ..	100	121 —123
£250,000	Stk	4½%	Do. 4% 2nd Deb. Stk. Red..	100	99 —101
100,000	5	2,6	Buenos Ayres & Belgrano Electric Trams, Ltd., Ord.	5	3⅛—3⅜
40,500	5	3/-	Do. "A" 6% Cum Pref. ..	5	5⅜—5⅝
27,000	5	3/-	Do. "B" do.	5	5 — 5½*

ELECTRIC TRACTION.—*Contd.*

Present Amount Subscribed.	Shares	Last Dividend	Name		Closing Prices
£200,000	Stk	5%	Buenos Ayres Elec. Trams Co. (1901 Ltd., 5% Db. Stk., Red		100
£220,000	100	6%	Buenos Ayres Gd. Nat., Ltd., 6% 1st Deb. Bds.	100	103 —105
102,268	5	5/-	Calcutta Tramways Co., Ltd. .		¼ — ½
£350,000	Stk	4½%	Do. 4½% 1st Deb. Stk., Red.	100	107—109
480,000	1	6d.	Cape Electric Tramways, Ltd. .	1	⅛ — ⅛
40,000	5	2/6	City of Birmingham Trams Co., Ltd. 5% Cum. Pref.	5	4½ — 4⅝
£300,000	100	4%	Do. 4% 1st Mort. Debs. .	100	103 —105
£120,000	Stk	5%	Colombo Elec. Tram. & Light. Co., Ltd., 5% 1st Mort. Deb. Stk. Red.	100	103 —105
60,000	10	6/-	Dublin United Trams. Co. (1896), Ltd., Ord. ..	10	13¾—14½
59,987	10	6/-	Do. 6% Pref.	10	15 — 16
30,000	5	2/6	Isle of Thanet Elec. Trams. and Light. Co., Ltd., 5% Cum. Pref.	5	2¾ — 3
£150,000	Stk	4%	Do. 4% Deb. Stock.. ..	100	82 — 88
125.000	10	5/-	London United Trams. (1901), Ltd., 5% Cum. Pref. ..	10	9 — 10½
£1.031,000	Stk	4%	Do. 4% 1st Mort. Deb. Stk. Red.	100	100 —103
£50,000	Stk	5%	Madras Electric Trams (1901), Ltd., 5% Deb Stock, Red.	100	103 —105
314,016	1	—	Metropolitan Elec. Trams, Ltd., Def.	1	⅛ — ¼
500,000	1	6d.	Do. 5% Cum. Pref... ..	1	1 — 1⅛
£350,000	Stk	4½%	Do. 4½% Deb. Stock, Red.	100	105 —107
50,000	5	6/-	New General Traction Co., Ltd., 6% Cum. Pref.	5	3½ — 4
110,923	8	2/9⅜	North Metropolitan Tramways Co..	8	4½ — 4⅝
£150,000	100	3½%	Do. 3½% Mort. Debs.	100	95 — 98
£196,200	Stk	5%	Perth Electric Trams, Ltd. (W.A.) 5% 1st Mort. Deb. Stock, Red..	100	104 —107
24,500	10	10/-	Potteries Elec. Traction Co., Ld., Or.	10	8½ — 9¼
24,500	10	5/-	Do. 5% Cum. Pref. ..	10	9 — 9¼
£220 000	Stk	4½%	Do. 4½% Deb. Stk., Red.	100	100 —104

IV.—ELECTRIC LIGHTING AND POWER.

Present Amount Subscribed.	Shares	Last Dividend	Name.	Paid up	Closing Prices
7,500	10	14/-	Bournemouth & Poole Elec. Sup. Co., Ltd., Ord. ..	10	11½ 12½
7,500	10	4/6	Do. 4½% Cum. Pref. ..	10	10 10*
7,500	10	6/-	Do. 6% Cum. Second Pf. ..	10	11 — 12
£70,000	Stk	4½%	Do. 4½% Deb. Stock Red ..	100	107 108
14,000	5	3/6	Bromley (Kent) Elec. Lt. & Pr. Co. Ld	5	5½ — 5⅝
£50,000	Stk	4½%	Do. do. 4½% 1st Deb. Stk. Red.	100	104 —107
27,507	5	4/6	Brompton & Kensington Elec. Supply Co., Ltd. Ord. ..	5	9½ 10½
12,493	5	3/6	Do. 7% Cum. Pref. Shares..	5	9½ 10½
60,000	5	5/-	Calcutta Elec. Sup. Cor. Ltd., Ord..	5	9 9⅞
£288,782	Stk	4%	Central Elec. Sup. Co., Ltd., 4% Gua. Deb. Stk. ..	100	100 103
70,000	5	2/6	Charing Cross & Strand Elec. Sup. Corp., Ltd., Ord... ..	5	7½ — 8
80,000	5	2/3	Do. do. 4½% Cum. Pref...	5	5 — 5⅛
£350,000	Stk	4%	Do. do. 4% Deb. Stk. Red.	100	105 105
41,436	5	2/8	Chelsea Elec. Sply. Co., Ltd., Ord.	5	5⅜ — 6⅛
£150,000	Stk	4½%	Do. do. 4½% Deb. Stk., Red	100	109 111
70,595	10	7/-	City of London El. Lghtg. Co., Ld., O.	10	13¾ 14⅜
40,000	10	6/-	Do. 6% Cum. Pref.	10	13 — 14½
£400,000	Stk	5%	Do. 5% Deb. Stk., Red ..	100	124 125
£300,000	Stk	4½%	Do. 4½% 2nd Deb. Stk., Red	100	103 106
40,000	10	4/-	County of London Elec. Supply Co., Ltd., Ord.	10	10 10⅜
30,000	10	6/-	Do. 6% Cum. Pref.	10	12 12⅜
£400,000	Stk	4½%	Do. 4½% Deb. Stk., Red. ..	100	111 114
70,000	5	2,6	Edmundson's Elec. Cor. Ltd., Ord.	5	5⅜ 6⅛
70,000	5	3/-	Do. 6% Cum. Pref.	5	6⅛ 6⅜
£300,000	Stk	4½%	Do. 4½% 1st Mort. Db. Stk. Reg	100	108 110
£80,000	Stk	5%	Electric Lighting & Traction Co. of Australia, Ltd. 5% Deb. Stk. Red.	100	85 — 90
10,000	5	2	Folkestone Elec. Supply Co., Ld., O	5	5⅛ 5⅜
£50,000	Stk.	4½%	Do. 4½% 1st Deb. Stk., Red.	100	99 102
15,000	10	—	Havana Electricity Co., Ltd... ..	10	9⅜ 10⅛
13,000	5	5/-	Hove Elec. Lighting Co., Ltd., Ord.	5	5 5⅛
£50,000	Stk	4½%	Isle of Wight Electric Light & Power Co., Ltd. 4½% Deb. Stock, Red.	100	100—103
150,000	1	—	Kalgoorlie Electric Power & Lighting Corp, Ltd., 6% Cum. Pref.	1	⅝ — ¾
21,000	5	5/-	Kensington and Knightsbridge Electric Lighting Co., Ltd., Ord. ..	5	12 13½

Stocks and Shares marked * are quoted ex-dividend

ELECTRIC LIGHTING AND POWER.—Contd.

Present Amount Subscribed.	Shares.	Last Dividend	Name	Paid up	Closing Prices.
£135,000	Stk	4%	Kensington and Knightsbridge Electric Lighting Co., Ltd., and the Notting Hill Electric Lighting Co., Ltd., 4% Deb. Stock, Red.	100	97 — 100
111,000	3	1 9/	London Elec. Supply Corp., Ltd., Ord.	3	2 — 2¼
60,000	5	3/-	Do. 6% Pref.	5	5¼ — 5½
£371,895	Stk	4 „	Do. 4% 1st Mort Deb. Stk. Red.	100	101 — 102
100,000	1	5/-	Metropolitan Elec. Sup. Co., Ltd., Or.	10	10 — 10¼
76,121	5	2/6	Do. 4½% Cum. Pref.	5	5⅛ — 5⅜
220,000	Stk	4½ „	Do. 4½% 1st Mort. Deb. Sk., Red.	100	109 — 111
250,000	Stk	3½ „	Do. 3½ „ Mort. Deb. Stk., Red.	100	98 — 100
£250,000	—	4½ „	Midland Elec. Corp. for Power Distribution Ltd., 4½ „ 1st Mort. Deb.	100	101 — 103
10,852	10	8/-	Notting Hill Elec. Ltg. Co. Ltd. Ord.	10	14 — 15
£59,000	100	4%	Do. 4 „ 1st Mort. Debs.	100	98 — 100
16,500	5	2/6	Oxford Electric Co. Ltd., Ord. ..	5	6⅜ — 6⅝
£50,000	Stk	4 %	Do. 4 „ Debenture Stk. Red.	100	100 — 102
£84,700	100	4½ %	Royal Elec. Co. (of Montreal) 4½ „ 20-yr. 1st Mort. Deb	100	100 — 103
40,000	5	5	St. James' & Pall Mall Elec. Light Co., Ltd. Ord.	5	14½ — 15¼
20,000	5	3/6	Do. 7 „ Pref.	5	5 — 5⅛
£150,000	Stk	3½ %	Do. 3½ „ Deben. Stock, Red	100	98 — 100
12,000	5	4/-	Smithfield Markets Elec. Supply Co., Ltd. Ord.	5	2¾ — 2⅞
£50,000	Stk	4 %	Do. 4% Debenture Stk. Red.	100	76 — 80
65,000	5	4/-	South London Elec. Sup. Co., Ltd., O.	5	3⅝ — 4⅛
100,000	1	—	South Metropolitan Elec. Light & Power Co., Ltd. Ord.	1	⅜ — ⅝
50,000	1	8d.	Do. 7% Cum. Pref	1	1⅜ — 1⅝
£100,000	Stk	4½ „	Do. 4½ „ 1st Deb. Stock Red.	100	105 — 108
50,000	5	2/6	Urban Electric Supply Co., Ltd., O.	5	4⅛ — 4½
30,000	5	2/6	Do. 5% Cum Pref.	5	5 — 5½
£200,000	Stk	4½ „	Do. 4½% 1st Mort. Deb. Stk. Red	100	103 — 105
110,000	5	6/6	Westminster Elec. Supply Corp. Ltd., Ord.	5	12⅞ — 13⅛
28,151	5	2/6	Do. 5% Cum. Pref.	5	6⅛ — 6⅜

V.—TELEGRAPH & TELEPHONE COMPANIES.

Present Amount Subscribed	Shares.	Last Dividend	Name	Paid up	Closing Prices.
£84,800	100	4 %	African Direct Tel. Co., Ltd., 4% Mt. Debs. (Series A), Red.	100	99 — 102
25,000	10	—	Amazon Telegraph Co., Ltd.	10	3 — ⅜
£763,580	Stk	14/-	Anglo-American Tel. Co., Ltd., Ord.	100	60 — 62*
£3,118,210	Stk	28/-	Do. 6% Preferred Ordinary	100	108 — 109*
£3,118,210	Stk	2 -	Do. Deferred Ordinary ..	100	16½ — 16¾
44,000	5	5/-	Chili Telephone Co., Ltd.	5	7⅛ — 7⅜
$15,000,000	$100	$2	Commercial Cable Co., Capital Stk.	$100	— —
£1,903,856	Stk	4 %	Do. Sterl. 500-yr 4 % Deb. Stk., Red.	100	97 — 99
16,000	10	5/-	Cuba Submarine Tel. Co., Ltd., Ord.	10	9 — 9¼
6,000	10	10/-	Do. 10% Preference ..	10	17½ — 18½
6,000	5	2/-	Direct Spanish Telegraph Co., Ord.	5	3⅜ — 3⅝
		5/-	10% Cum. Preference	5	9¼ — 9⅝
£30,000	50	4½ %	Do. 4½% Debs.	50	100-103
60,710	20	4/-	Direct U.S. Cable Co., Ltd. ..	20	11¼ — 12¾
£85,800	100	4½ %	Direct West India Cable Co., Ltd., 4½% Reg. Debs.	100	100 — 102
£300,000	100	4%	East. & S. African, Ltd., 4% Mt. Debs.	100	99½ — 101¼
£200,000	25	4 %	Do. 4% Rg. Mt. Dbs. (Mauritius Subsidy) ..	25	101¼ 103¼%
300,000	10	2/6	Eastern Extension, Australasia and China, Ltd. ..	10	13⅜ — 14¼*
£602,400	Stk	4%	Do. 4% Mort. Deb. Stk., Perp.	100	106 — 108
£4,000,000	Stk	25/-	Eastern Tele. Co., Ltd., Ord. ..	100	142 — 145*
£2,000,000	Stk	17/6	Do. 3 % Pref.	100	89 — 91*
£1,838,814	Stk	4 %	Do. 4% Mort. Deb.	100	108 — 110
150,000	10	5/-	Great Northern Telegraph Co., Ltd., (of Copenhagen) ..	10	35½ — 36½
£58,700	100	4½ %	Halifax and Bermudas Cable Co., Ltd., 4½% 1st. Mort. Debs. Red.	100	100 — 102
17,000	25	12/6	Indo-European Tele. Co., Ltd. ..	25	54½ — 56½
72,680	1	7½d.	Monte Video Telephone Co., Ltd., O.	1	⅝ — ¾
£1,983,333	Stk	6 %	National Telephone Co., Ltd., Pref.	100	112 — 113
£1,966,667	Stk	5 %	Do. Deferred	100	107 — 108
250,000	5	2/6	Do. 5% Non-Cum. 3rd Pref.	5	5⅜ — 5⅝
£2,000,000	Stk	3½ %	Do. 3½% Deb. Stk., Red. ..	100	98 — 100
£689,593	Stk	4 %	Do. 4% do. do. ..	100	104 — 106
179,313	1	8d.	Oriental Telephone & Elec. Co., Ltd.	1	1⅛ — 1⅜
50,000	1	7½d.	Do. 6% Cum. Pref.	1	1⅛ — 1⅜
£100,000	100	4 %	Pacific & European Tel. 4% Guar. Debs. Red. ..	100	100 — 103
11,889	8	4/-	Reuter's Telegram Co., Ltd. ..	8	7⅜ — 8¼*
58,000	5	3/-	United River Plate Telep. Co., Ltd.	5	7 — 7⅜
40,000	5	2/6	Do. 5% Cum. Pref.	5	5¼ — 5⅜
£179,947	Stk	5 %	Do. 5% Deb. Stock, Red. ..	100	110 — 112
15,609	10	5/-	W. African Telegraph Co., Ltd. ..	10	10 — 10½
£30,008	2½	—	West Coast of America, Ltd. ..	2½	⅜ — ½
150,000	100	4%	Do. 4% Deb. Guar. by West. Tel.	100	100 — 102

TELEGRAPHS AND TELEPHONES.—

[illegible]	Shares.	Last Dividend	[illegible]	Paid up	[illegible]
[illegible]	10	6d.	W. India & Panama Telegraph Co., Ltd.	[illegible]	[illegible]
[illegible]	10	6/-	Do. 6% Cum. 1st. Pref.	10	[illegible]
[illegible]	10	6	Do. 6% Cum. 2nd Pref.	10	[illegible]
£80,000	100	5	Do. 5% Deb.	[illegible]	[illegible]
207,930	10	3/-	Western Telegraph Co., Ltd.	10	14 — 14½
[illegible]	100	5	Do. 5% Deben., 2nd Series	100	101 — 103
[illegible]	Stk	4	Do. 4% Deb. Stock, Red. ..	[illegible]	[illegible]

VI. SHIPPING COMPANIES.

[illegible] Subscribed	Shares.	Last Dividend	[illegible]	Paid up	[illegible] Prices.
32,500	10	5/6	Ancona Line (Henderson Bros., Ltd., 5½% Cum. Pref.	10	9½ — 9¾
£327,000	Stk	4½	Do. 4½% Red. 1st Mort. Deb. Stk.	100	101 — 103
£672,000	Stk	4½	British & African Stm. Nav. Co., Ltd., 4½% 1st Mort. Deb. Stk. Red.	100	97 — 99
10,000	10	5/6	Bucknall Steamship Lines, Ltd., 5½% Cum. Pref.	10	5½ — 6
£600,000	Stk	4½ „	Do. * 4½% 1st Mort. Deb. Stk.	100	87 — 91
£750,000	Stk	4½	Clan Line Steamers, Ltd., 4½% Deb. Stk. Red.	100	99 — 101
60,000	20	16/	Cunard Steam Ship Co., Ltd., Nos. 1-60,000..	20	13½ — 13⅝
40,000	20	8/	Do. Nos. 60,001-100,000	10	6 — 6½
£461,430	Stk	4½ „	Elder Dempster Shipping, Ltd., 4½% 1st Mort. Deb. Stk. ..	100	104 — 106
1,200,000	1	6d.	Furness, Withy & Co., Ltd., Ord...	1	1 — 1⅜
25,328	7½	4/7	Gen. Steam Navigation Co., Ltd., Ord.	7½	8½ — 8⅝
36,758	8	4 9/	Do. Non-Cum. 6% Pref.	8	8¼ — 8⅜
£150,000	Stk	4%	Do. 4% 1st Mort. Deb. Stk. Red.	100	98 — 100
55,000	5	1/3	Houlder Line, Ltd., Ord.	5	2 — 2½
40,000	5	2/9	Do. 5½ % Cum. Pref.	5	2⅝ — 4½
£200,000	Stk	4½%	Do. 4½% 1st Mt. Deb. Stk. Red.	100	86 — 88
141,500	10	5/-	Leyland (Fredk.), & Co.. (1900), Ltd., 5% Cum. Pref. ..	10	7⅜ — 8⅛
£1,160,000	Stk	5 %	Peninsular and Oriental Steam Nav. Co., 5% Cum. Pref. ..	100	129 — 132
£1,160,000	Stk	19%	Do. do Deferred ..	100	233 — 236
15,000	100	30/-	Royal Mail Steam Packet Co. Ord.	60	40½ — 41
39,075	5	2/6	Shaw, Savill & Albion, Ltd., 5% Cum. "A" Pref..	5	4½ — 5½
39,075	5	2/6	Do. "B" Ord...	5	3⅞ — 4½
141,841	10	4/-	Union Castle Mail Steamship Co., Ltd., Ord..	10	9⅞ — 10½
24,000	10	4/6	Do. 4½% Cum. Pref..	10	10½ — 11
£1,008,894	Stk	4%	Do. 4% Debenture Stk., Red.	100	100 — 102

VII.—MISCELLANEOUS COMPANIES.

Present Amount Subscribed.	Shares.	Last Dividend.	Name	Paid up	Closing Prices.
60,000	1	9¾d.	Chadburn's (Ship) Tele. Ltd., Ord...	1	1 — 1⅛
£750,000	Stk	5%	General Hydraulic Power Co., Ltd.	100	123 — 128
12,500	10	10/-	Oakey (John) and Sons, Ltd., Ord..	10	25 — 27
10,000	10	6/-	Do. do. 6% Cum. Pf.	10	14½ — 15½
183,538	1	6·3d.	Power Gas Corp., Ltd., Ord., Nos. 66,463-250	15/	¼ — ⅜
66,462	1	8·4d.	Do. do. Nos. 1-66,462	1	⅜ — ½
135,000	1	6d	Waygood (R.) & Co., Ltd., Ord. ..	1	1⅛ — 1¼
135,000	1	7½d.	Do. 6% Cum. Pref. ..	1	1⅛ — 1¼

RAILWAY CARRIAGE & WAGON COMPANIES.

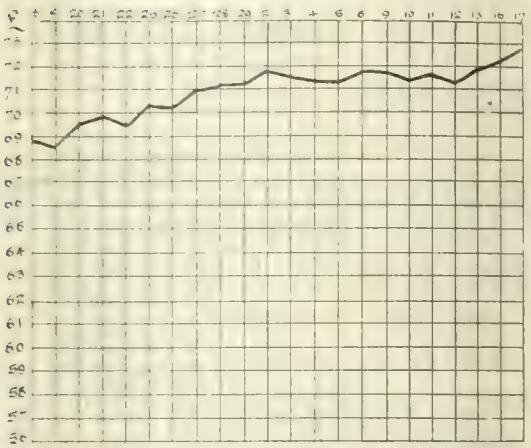
Present Amount Subscribed.	Shares.	Last Dividend	Name	Paid up	Closing Prices.
10,000	10	7/6	Birm. Railway-Car, & Wagon, L., 1-10,000	10	23 — 24
8,739	10	3/-	Do. Second Issue 1-8,739	3	8½ — 9½
10,000	10	6/-	Do. Cum. Pref. 6% 1-10,000..	10	13½ — 14
30,111	7	7/-	Gloucester Rail.-Car & Wagon, Ld., A, 1-29,861 & 49,751-50,000	7	9½ — 10
44,889	7	3/6	Do. B, 29,862-49,750, 50,001-75,000	7	4½ — 4⅝
14,567	10	1/3	Lancashire Wagon, Ord. ..	2	2 — 2¼
4,150	10	5%	Do. do. ..	10	102 — 104½
784,808	1	9d.	Metropolitan Amalgamated Rail.-Carriage & Wagon, Ld., 1-784,808	1	44/6 — 45/6
164,288	1	6d.	Do. Cum. A Pref. 5% 1-164,288	1	24/- —24/6
235,000	1	7½d.	Do. Cum. B Pref. 6% 1-235,000	1	28/6 — 29/-
20,000	20	20/-	Midland Rail.-Car & Wagon, Ld., 1-20,000	10	19½ — 20½

Stock and Shares marked * are quoted ex-dividend

THE HOME METAL MARKET.

SHOWING DAILY FLUCTUATIONS FROM SEPTEMBER 18TH TO OCTOBER 17TH, 1905.

COPPER.



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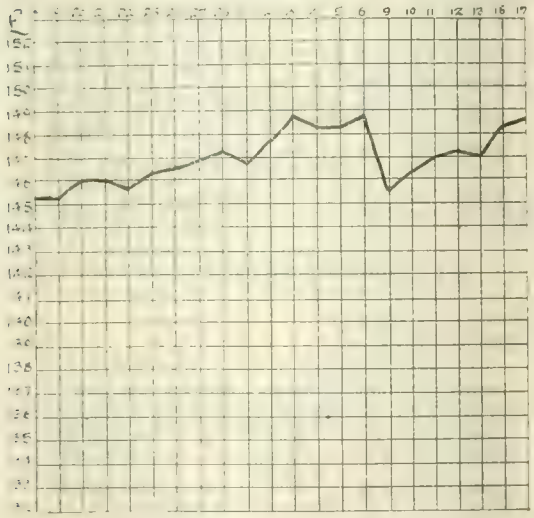
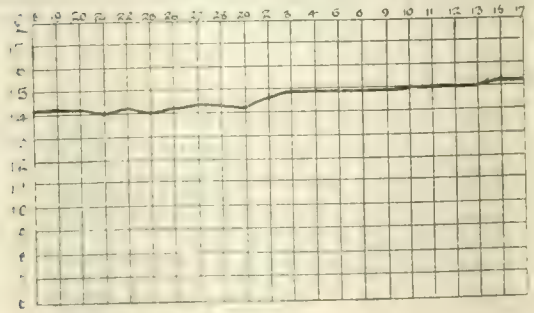
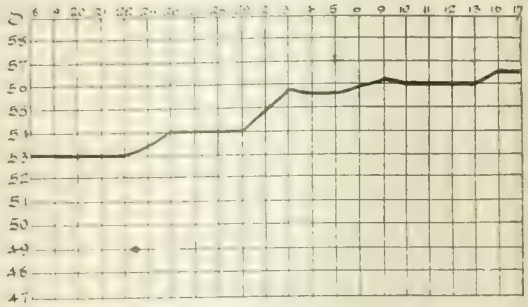


ENGLISH LEAD.



PIG IRON: SCOTCH.



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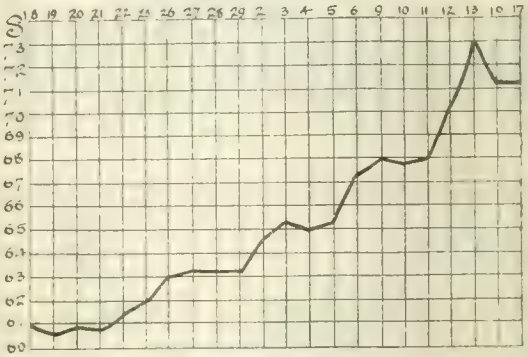
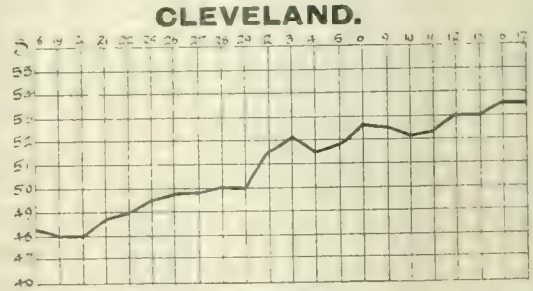


CLEVELAND.



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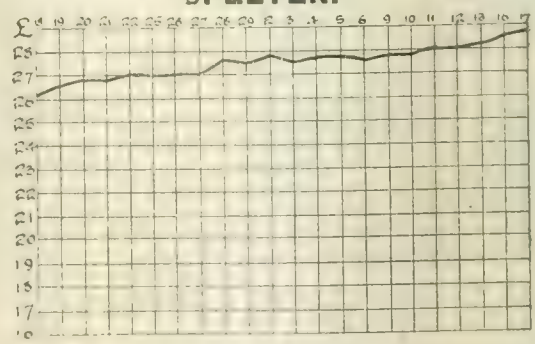


PRICES CURRENT OF COAL, IRON, STEEL, AND OTHER METALS.

MANUFACTURERS' AND MERCHANTS' QUOTATIONS.

MARKET REPORT.

Wednesday, October 18th, 1905.

THE Copper market has strengthened during the past few days, the contributing causes being firmer American advices, an improved demand on continental account, and the statistical position. Messrs. Henry R. Merton and Co., Ltd., give the visible supply as 15,531 tons, against 10,304 tons on September 30th. The supplies for the fortnight amount to 12,711 tons, and the deliveries to 13,534 tons, and the stocks in England and France are 8,331 tons, against 8,304 tons. Chile charters for the first half of October total 1,100 tons. The speculative support has been good, with satisfactory business for forward dates, and the immediate tendency appears to be towards higher prices. Cash and October dates command £72 15s.; three months, £71 2s. 6d.

A fair business is reported in Tin, Eastern advices being rather firmer. As stated last week, the markets fell sharply on rumours that there will be no reduction at Banca sales, but the strong statistical position brought about a subsequent improvement in quotations, and the course of prices is again upward. The market has been stimulated by inquiries on American account, and there has been some good buying on home account during the past day or two. The latest quotations are £149 10s. cash, and £148 7s. 6d. three months.

Lead has been strong, good buying being in evidence both on home account and for Continental consumers. The tone continues firm, and with holders playing a waiting policy, the rise in quotations has made further progress. Soft foreign prompt is quoted £14 17s. 6d.

The increasing scarcity of Spelter and the continuance of a good demand has given this market a strong fillip. Producers are sold out well ahead and the galvanising trade is making contracts for distant delivery. Ordinaries are fetching £28 10s. and Specials £28 15s.

Buoyancy has been the leading characteristic of the iron and steel markets and there has been a recrudescence of rampant speculation affecting not only Cleveland but Hematite iron. Standard iron has benefited and Cleveland has now improved to 54s. 4d. and hematite to 72s. 1½d. The position of the iron and steel trades is one of great activity, and a boon appears to be in process of inception.

IRON, STEEL, PIG-IRON, &c.

SCOTLAND.

Messrs. David Colville and Sons, Ltd., Dalzell Steel and Iron Works, Motherwell, N.B., quote as follows. Prices delivered in Glasgow or equal:—

Steel:		£	s.	d.
DALZELL	Siemens' Steel Plates, Marine Boiler Quality ..	7	12	6
	,, ,, ,, Land ,, ,,	7	12	6
STEEL	,, Steel Bars, Boiler Quality	8	0	0
DALZELL	Siemens' Steel Plates, Ship Quality Plates ..	6	17	6
	,, ,, Bars ,, ,, ...	7	10	0
STEEL	,, ,, Angles	6	10	0

Manufactured Iron:

Bars—Dalzell	6	12	6
,, Best	7	2	6
,, ,, Horseshoe	7	2	6
,, Angle	6	12	6
,, Best Angle	7	2	6
,, Best Best	7	12	6
,, Extra Best	8	2	6

Usual terms and extras. Special rates for delivery in England and export. The above prices subject to alteration without notice.

The Glasgow Iron and Steel Co., Ltd., Wishaw, quote as under (prices are delivered Glasgow or equal):—

(Glasgow Steel)	£	s.	d.	
Steel Angles	6	10	0	per ton.
Steel Ship Plates	6	17	6	,,
Steel Bars, Ship Quality	7	10	0	,,
Glasgow Steel.				
Steel Bars, Boiler Quality	8	0	0	,,
Steel Land Boiler Plates	7	7	6	,,
Steel Marine Boiler Plates	7	7	6	,,

Less 5 per cent. discount. Extras as per standard list.

Special prices for delivery in England and for export. The above prices subject to alteration without notice.

John Spencer (Coatbridge), Ltd., Phœnix Iron-works, Coatbridge, N.B., quote:—

	£	s.	d.
Bars—Phœnix	6	15	0
,, Best	7	5	0
,, Best Best	7	15	0
Extra Best	8	5	0
,, Best Horse Shoe	7	5	0
,, Extra B.H.S.	8	5	0
,, Extra Best Cable	8	15	0
,, Rivet	6	15	0
Best Scrap Rivet	7	15	0

	£ s. d.
Angles—Phœnix	6 15 0
,, Best	7 5 0
,, Extra Best	7 15 0
Gas Tube Hoops—Phœnix Best	7 5 0
Plates—Phœnix	—
,, Best Boiler	8 0 0
,, Best Best Boiler	8 10 0
,, Extra Best Boiler	9 10 0
Boiler Tube Strips—Phœnix Best Best	8 10 0

All per ton, delivered f.a.s., Glasgow, Greenock, Grangemouth, Granton, Leith, or Ardrossan. 5 per cent. discount cash monthly.

Messrs. R. Feldtmann and Co., of Glasgow, quote Commission extra).

Pig Iron:

	No. 1. £ s. d.	No. 3. £ s. d.
Coltness, f.a.s. Glasgow	—	3 0 0
Gartsherrie ,,	3 5 0	3 1 0
Summerlee ,,	3 10 0	3 5 0
Carnbroe ,,	3 2 0	2 19 0
Langloan ,,	3 6 0	3 1 0
Calder ,,	3 5 0	3 1 0
Clyde ,,	3 4 6	3 0 0
Glengarnock, f.o.b. Ardrossan	3 5 0	3 0 0
Eglinton ,, ,,	3 1 6	2 18 6
Dalmellington, ,, Ayr	—	2 18 6
Shotts ,, Leith	3 5 0	3 1 0

NORTH OF ENGLAND.

Messrs. W. Whitwell and Co., Ltd., Thornaby Ironworks, Stockton, quote as follows, **at works:—**

	£ s. d.
W.W. ♔ Bars	6 17 6
W.W. Best Bars	7 7 6
W.W. Best Best	7 17 6
W.W. Best Best Best	8 7 6
W.W. Best Shoe	7 7 6
Thornaby ♔	8 7 6
Thornaby Best	8 17 6
Thornaby Best Best	9 17 6
Whitwell Special Admiralty Cable	10 10 0
Special Chain Iron	9 10 0
Tube and Nail Strips	7 0 0
W.W. ♔ Angle Iron	7 0 0
W.W. Best Angle Iron	7 10 0
Tee Iron, to 8 inches United	7 17 6

Terms, Cash, less 2½ per cent. discount on 10th of month following delivery.

LANCASHIRE.

The Pearson and Knowles Coal and Iron Company, Ltd. Dallam and Bewsey Forges, Warrington, announce that in the present uncertain state of the market, their quotations are temporarily withdrawn.

WORCESTERSHIRE.

Baldwins Ltd. (with which is amalgamated Knight and Crowther, Ltd.), Wilden Works, near Stourport, quote:—

Black Sheets	Singles 20 G 96in. by 36in. per ton. £ s. d.	Doubles 21 G to 24 G 96in. by 36in. per ton. £ s. d.
"Vale"	10 0 0	10 10 0
"Shield"	10 10 0	11 10 0
"Severn"	11 10 0	12 10 0
"Baldwin Wilden B."	12 10 0	13 10 0
Charcoal	16 10 0	17 10 0
Best Charcoal	18 10 0	19 10 0

Pickled, cold-rolled and close annealed sheets specially quoted for.

Extra widths, Singles to 66in., Doubles to 56in., Lattens to 46in. Extra lengths, Singles to 168in., Doubles to 132in., Lattens to 108in.

Patent Coated Sheets:

	£ s. d.	£ s. d.
No. 3 Lead	13 10 0	14 10 0
S.V. Lead	15 0 0	16 0 0
No. 3 Terne	15 0 0	16 0 0
S.V. Terne	16 10 0	17 10 0

Tinned Sheets:	Singles 20 G to 108 by 36in. per ton. £ s. d.	Doubles 21 to 24 G to 96 by 36in per ton. £ s. d.
Best Coke (Finish)	29 0 0	30 10 0
,, Charcoal (Finish)	31 0 0	32 10 0
Extra ,,	33 0 0	34 10 0

Cotton Can Tin Sheets to 39in. by 36in. specially quoted for.
Tin Plates, "Cookley, K" Best Charcoal, £1 7s. 0d. per box.
Extreme sizes in Tin and Patent Coated specially quoted for.
Lattens up to 36 wide by 27 W.G. £1 10s. 0d. per ton extra throughout for all brands.
At works.

Galvanized Corrugated Sheets:

	£ s. d.	
"Phœnix" Brand, 24 G., f.o.b. London, in Bundles	12 15 0	per ton.
"Blackwall" Brand, 26 G., in felt-lined cases for Australia, f.o.b. London	15 10 0	,,

Galvanized Working Up-Sheets:

	£ s. d.	
24 G., f.o.b. London, in Bundles	13 15 0	per ton.

STAFFORDSHIRE.

Shelton Iron, Steel, and Coal Co., Ltd., Stoke-on-Trent, North Staffordshire, and 122, Cannon Street, London, quote:—

	£ s. d.	
Crown Bars	6 15 0	per ton.
Best Bars (1 to 6in. wide, above ¼ in. thick, ½ in. to 4 rounds and squares)	7 5 0	,,
Angles	7 0 0	,,
,, Best	7 10 0	,,
T's	7 5 0	,,
,, Best	7 15 0	,,
Best Shoe Iron	8 5 0	,,
,, Rivet Iron	8 5 0	,,
,, Best Rivet (Special)	9 10 0	,,
,, Cable	9 10 0	,,
,, Screwing	8 10 0	,,

	£	s.	d	
Best Turning	8	5	0	per ton.
,, Plating	8	10	0	,,
Best Best	9	10	0	,,
Treble Best	10	10	0	,,
Plates	7	15	0	,,
Best Plates	8	5	0	,,
,, Boiler Plates	8	15	0	,,
,, Best Boiler Plates	9	15	0	,,
Treble Best Boiler Plates	12	5	0	,,

Delivery f.o.b. Liverpool, Birkenhead or Manchester

WALES.

Cordes (Dos Works), Ltd., of Newport, Mon., quote "Star" brand patent wrought nails, steel nails, &c

Discounts—

45 per cent. off 1-inch to 3-inch strong rose and all fine rose and 6dy. and 8dy. pound.

40 per cent. off 3½ inch to 7-inch strong rose and 10dy. and 20dy. pound.

40 per cent. off all sharp-pointed nails.

Delivered in lots of 4 cwt. and upwards. Extra 2½ per cent. discount off the gross on two tons and upwards.

Steel rose, flat points, 5-inch to 7-inch basis :—

2 tons 9/9 per cwt.
4 cwt. lots and upwards 10/- per cwt. } d/d any Railway Station

Steel cut nails, 3-inch basis—

2 tons 8/6 per cwt.
4 cwt. lots 8/9 per cwt. } d/d any Railway Station.

Slit rods (iron) £7 10s. per ton, at works for 2-ton lots.

Messrs. Richard Thomas and Co., Ltd., of 33 and 35, Eastcheap, E.C. — Works: South Wales, Burry, Lydney, Lydbrook, and Cwmbwrla, quote :-

Coke Tin-plates.	Per Box. f.o.b. Wales. £	s.	d.
C 18¾ by 14 124s. 110 lb. "BV"	0	13	0
C 20 by 10 225s. 155 ,, "Jumbo"	0	18	1½
C 20 by 14 112s. 108 ,, "Lydbrook"	0	12	9
C 28 by 20 112s. 216 ,, "Lydbrook"	1	5	9
Charcoal Tinplates :			
C 20 by 14 112s. 108 lb. "Allaway"	0	13	6

BELGIUM.

C. L. Faulkner, Suffolk House, Laurence Pountney Hill, London, E.C., quotes :—

Prices quoted are in £ stg. and per ton of 1,015 kos. (2,240 lb.) delivered free on board ANTWERP for approved quantities.

Steel:	£	s.	d	
Blooms	at 3	18	0	per ton.
Billets	at 4	0	0	,,
Sheet Bars	at 4	2	0	,,
Finished Steel :				
Bars	at 5	5	0	per ton.
Angles	at 5	6	0	,,
Tees	at 5	9	0	,,
Joists	at 4	15	0	,,
Fencing Standards	at 5	9	0	,,
Shoeing Bars	at 5	7	6	,,
Tyre Bars	at 5	7	6	,,
Half-Round Bars	at 5	15	0	,,
Heavy Rails	at 5	5	0	,,
Light Rails	at 4	17	6	,,

Structural Steelwork :

Prices on application.

METALS.

Messrs. French and Smith, 147, Leadenhall Street, and 11, Oldhall Street, Liverpool, quote :—

TIN.

Tin :	£	s.	d		£	s.	d	
English Ingots, f.o.b.								
Dis. 1¼ % & 1	149	10	0	to	150	0	0	per ton
English Bars, f.o.b.								
Dis. 1¼ % & 1	150	10	0	to	151	0	0	,,
Straits G.M.B., cash Warehouse, Net	148	6	0	to	148	10	0	,,
Straits G.M.B., 3 months, Warehouse, Net	147	15	0	to	148	0	0	,,
Australian, Mt. Bischoff, Warehouse, Net	148	15	0	to	149	0	0	,,

COPPER

Copper :	£	s.	d.		£	s.	d.	
Standard G.M.B., cash Warehouse, Net	72	15	0	to	73	0	0	per ton.
Standard G.M.B., 3 months, Warehouse, Net	71	0	0	to	71	5	0	,,
English, Tough, Cake & Ingot, Warehouses, Net	76	10	0	to	77	0	0	,,
English, Best Select, Warehouse Net	77	0	0	to	77	10	0	,,
English, Sheets and Sheathing, f.o.b., Dis. 2½ %	84	0	0	to	85	0	0	,,
English, Sheets for India, f.o.b., Dis. 2½ %	80	0	0	to	80	10	0	,,
Electro, Warehouse, Net	76	15	0	to	77	0	0	,,
Ore, ex. ship	0	13	3	to	0	14	3	per unit
Regulus, Matte and Precipitate, ex ship,	0	14	3	to	0	14	9	,,

YELLOW METAL.

Yellow Metal :	£	s.	d.	
Sheets, 4 by 4 feet for India f.o.b. Dis. 2½ %	0	0	6¾	per lb
Sheathing ,, ,,	0	0	6⅞	,,

SPELTER.

	£	s.	d.		£	s.	d	
Silesian outports, Net	28	10	0	to	28	15	0	per ton.
Blende of 50 % Net	8	0	0	to	8	1	6	,,
Calamine, Net	8	2	6	to	8	4	0	,,

LEAD

	£	s.	d.		£	s.	d.	
English Pig, Warehouse, Dis. 2½ %	15	2	6	to	15	5	0	per ton.
Spanish, ex ship, Dis. 2½ %	14	18	9	to	15	0	0	,,
Lead Ore of 70 %, Net	7	9	0	to	7	10	0	

ANTIMONY.

	£	s.	d.		£	s.	d.	
Star Regulus, f.o.b., Dis. 2½ %	32	0	0	to	34	0	0	per ton.
Ore, 50 %, ex ship, Dis. 2½ %	15	0	0	to	15	10	0	,,
Crude, ex ship, Dis. 2½ %	34	0	0	to	36	0	0	,,

QUICKSILVER.

	£	s.	d.	
Spanish, 75 lb., Warehouse, Net	7	5	0	per flask
Italian ,, ,,	7	2	6	,,

COAL.

LEICESTERSHIRE.

The Nailstone Colliery Company, Leicester, quote. Price per Ton at Pit of 20 Cwt., with ½ Cwt. per Ton for wastage :—

Upper Main Seam.

	s.	d.
Main Coal	6	6
Best Hard Steam (hand picked, as used by the Railway Companies)	5	6
Best Hard Steam Cobbles (made through 6 in. mesh, free from slack)	6	0
Fine Slack	0	6

Terms, net cash on 10th of month following delivery.

DERBYSHIRE.

The Manners Colliery Co., Ltd., of Ilkeston quote as follows, per ton at pit :

Kilburn Coal :

	s.	d.
Best London Brights	9	3
Large Nuts (1½ to 3½)	9	0
Small Nuts (¾ to 1½)	6	0
Peas (⅝ to ¾)	5	0
Rough Slack	4	0
Slack	3	6
Smudge	2	0

Rutland Coal :

Brights (4 to 8	7	6
Large Nuts (2 to 4	7	0
Slack	3	6
Hand-picked Hards	7	6
Hard Cobbles	6	3

The Clay Cross Company's Collieries, Clay Cross, near Chesterfield, quote:—

	per ton at pit. s.	d.
Best Main Coal	10	0
Best Silkstone	9	6
Best House Coal	8	0
Best House Nuts	7	6
Treble Screened Cobbles	7	3
Best Cobbles	6	9

NOTTINGHAMSHIRE.

The Digby Colliery Co., Ltd., near Nottingham, quote per ton at pit :—

Digby Coal :

Steam.	s.	d.
Best Hand Picked Hard	8	6
Steam Hard	7	3
Hard Nuts	6	6

Gedling Colliery.

High Hazel.

London Brights, 4 to 8 in. cube	10	6
Bright Cobbles (Hand Picked)	10	0
Large Nuts, 2 to 4 in. cube	9	6
Small Nuts, 1 to 2 in. cube	6	0
Pea Nuts, ¾ to 1 in. cube	5	0

Steam—Top Hard

Best Hard	8	6
Hard Steam	7	6
Cobbles	6	3

CHEMICALS.

Messrs. S. W. Royse and Co., Albert Square, Manchester, quote :

		£	s.	d.	
Acids :	Oxalic	0	0	2½	per lb.
	Picric, Crystals	0	0	10	,,
	Tartaric at Manchester	0	0	10¾	,,
Acetate of Lime :	Brown at Manchester net	8	10	0	per ton.
	Grey ,,	11	15	0	,,
Alumina :	Alum, Lump, loose	5	5	0	,,
	,, ,, in casks	5	7	6	,,
	,, Ground, in bags	5	15	0	,,
	Sulphate of Alumina, 14%	4	10	0	,,
Ammonia :	Carbonate	0	0	3½	per lb.
	Muriate Grey f.o.b. Liverpool	24	0	0	per ton.
	Sal-ammoniac, Lump, 1sts, deld. U.K.	42	0	0	,,
	,, ,, 2nds, ,,	40	0	0	,,
	Sulphate f.o.b. Liverpool	12	17	6	,,
Arsenic :	Best White Powdered net	14	15	0	,,
Bleaching Powder, 35°	,,	4	7	6	,,
Borax :	British Refined Crystal ,,	13	0	0	,,

Coal Tar Products :

Benzole, 50 90 %	,,	0	0	7½	per gal.
,, 90%	,,	0	0	8½	,,
Carbolic Acid Crystals, 34 35° C.	,,	0	0	5¾	per lb.
,, ,, ,, 39/40° C.	,,	0	0	6	,,
,, ,, Liquid, 97 99 %	,,	0	0	9	per gal.
,, ,, Crude, 62½% at 60 F. f.o.b.	,,	0	1	8	,,
Creosote, ordinary good liquid	,,	0	0	1	,,
Naphtha, Crude, 20 % at 120° C.	,,	0	0	3½	,,
,, Solvent, 90% at 160° C. f.o.b	,,	0	0	10½	,,
,, ,, 95 % at 160° C. ,, ,,	,,	0	0	11½	,,
,, ,, 90 % at 190° C. ,, ,,	,,	0	1	0	,,
,, Rectified, flash point over 73° F. f.o.b.	,,	0	0	11½	,,
,, Rectified, flash point over 100° F. f.o.b.	,,	0	1	0½	,,
Naphthalene, all qualities.					
Pitch f.a.s. Manchester.	,,	1	10	0	per ton.
Copperas : Green, in bulk	,,	0	12	6	,,
,, barrels f.o.b. L'pool	,,	1	18	6	,,
Cake	,,	1	1	6	,,
Copper : Sulphate		22	0	0	,,
Cyanides : 98% minimum f.o.b	net	0	0	7½	per lb.
Lead : Acetate (Sugar) White, English		27	10	0	per ton.
,, ,, ,, Foreign c.i.f. U.K		23	15	0	,,
,, ,, Grey		21	15	0	,,
,, ,, Brown at Manchester		17	5	0	,,
Nitrate		25	10	0	,,
Litharge, Flake		16	10	0	,,
,, Powder		17	0	0	,,
Red Lead, Genuine, c.i.f. London less 5%		16	0	0	,,
White ,, ,, Dry ,, ,, ,,		17	0	0	,,
Naphtha (Wood) : Miscible, 60 o.p.		0	2	6	per gal.
Solvent		0	2	7	,,
Potash : Bichromate delivered England		0	0	3	per lb
Carbonate, 90/92 % c.i.f Hull		17	15	0	per ton.
Caustic, 75/80 ,, ,, ,,		19	5	0	,,
Chlorate net		0	0	3½	per lb.
Montreal in Store, Liverpool		31	0	0	per ton.
Prussiate Yellow net		0	0	4½	per lb.

		£	s.	d.	
Soda:	Ash, Caustic, 48 %, Ordinary net	5	5	0	per ton.
	,, ,, ,, Refined ,,	6	5	0	,,
	,, Carbonated, 48 %	5	10	0	,,
	,, ,, 58 % (Ammonia Alkali) net	4	10	0	,,
	,, Bleachers' Refined Caustic 50/52 % ... net	6	10	0	,,
	Caustic, White, 77 % ... ... ,,	10	12	6	,,
	,, ,, 70 % ... ... ,,	9	12	6	,,
	,, ,, 60 % ,,	8	12	6	,,
	,, Cream, 60 % ... ... ,,	8	10	0	,,
	Crystals, in bags	3	0	0	,,
	,, barrels ...	3	7	6	,,
	Acetate ... c.i.f. Hull net	16	10	0	,,
	Bicarbonate, in 1 cwt. kegs ...	6	15	0	,,
	Bichromate...delivered England...	0	0	2¼	per lb.
	Chlorate ... net	0	0	3½	per lb.
	Nitrate...ex quay Liverpool, ...	10	10	0	per ton.
	Phosphate ...	9	5	0	,,
	Prussiate ...net	0	0	3⅜	per lb.
	Silicate, Solution, 140° Tw. ...	4	10	0	per ton.
	Sulphate (Glauber Salts)...	1	10	0	,,
	,, (Saltcake, 95 %)...	1	15	0	,,
Sulphur:	Recovered	4	15	0	,,
	Roll ...	6	15	0	,,
	Flowers	7	10	0	,,
Zinc:	Sulphate	6	15	0	,,
Shellac:	Standard TN orange spot ...	9	0	0	per cwt.

MINERALS.

Messrs. S. W. Royse and Co., quote:—

		£	s.	d.	
Barytes:	Lump Carbonate, 90/92 %	3	10	0	per ton.
	Sulphate, No. 1, White ...	2	15	0	,,
China Clay:	of various qualities for all purposes; prices from about 11/- to about 30/- per ton, f.o.b. Cornwall: stocks also kept at Runcorn and Preston. Quotations given carriage paid.				
Chrome Ore:	Basis 50% c.i.f. British Ports...	3	10	0	,,
Manganese:	Lump c.i.f. Liverpool 10½d.	per metallic unit.			
Ochre:	French JC f.o.b. Rouen, net	2	5	0	per ton.
	,, JF ...	5	10	0	,,
Talc:	(French Chalk)... c.i.f. Liverpool	3	10	0	,,

Messrs. Henry Bath and Son, quote:—

	£	s.	d.		£	s.	d.	
Copper, Ores of, 10 to 25	0	13	4½	to	0	14	4½	per unit.
Regulus, 45 to 55% ...	0	14	4½	to	0	14	10½	,,
Precipitate, 65 to 80 ...	0	14	6	to	0	15	0	,,
Tin Ores, 70	93	0	0	to	95	0	0	per ton
Lead Ore, 70% ...					7	19	0	,,
Blende, 50% ...					8	6	6	,,
Calamine...					8	9	0	,,
Antimony, Star Regulus	50	0	0	to	52	0	0	,,
,, Ore 50% ...	15	0	0					

Messrs. Barrington and Holt, Cartagena, quote:—

Iron Ore.

			£	s.	d.	
Ord. 50%, ...f.o.b.	Porman ...		7	6		per ton.
Do. ... ,,	Cartagena		7	10		,,
Special low phos, ,,	Porman ...					
Do. do. ,,	Cartagena...		8	2		,,
Extra quality do. ,,	,, ...		8	6		,,
Special Iron Ore ,,	,, ...		nominal			,,
Specular 58% do, ,,	...		11	0		,,

TIMBER.

Messrs. Alfred Dobell and Co., Liverpool, quote:—

COLONIAL WOODS.

Timber.

		£	s.	d.		£	s.	d.
Quebec Square White Pine...	per cub. ft.	0	1	9	to 0	3	3	
Quebec Waney Board Pine...	,,	0	2	8		0	3	9
St. John Pine, 18 in. average	,,	0	2	4		0	3	3
Lower Ports Pine...	,,	0	1	3		0	1	8
Quebec Red Pine... ...	,,	0	1	6		0	2	3
Quebec Oak, 1st quality ...	,,	0	2	3		0	3	4
Quebec Oak, 2nd quality ...	,,	0	1	6		0	2	6
Ash ...	,,	0	1	6		0	2	3
Elm	,,	0	3	3		0	4	0
Hickory ...	,,	0	2	0		0	2	6
Quebec Birch	,,	0	1	6		0	2	3
St. John Birch ...	,,	0	1	6		0	2	0
Birch Planks ...	,,	0	0	9		0	0	11
Spruce Spars ...	,,	0	0	10		0	1	0

Deals.

1st quality Quebec Pine ...	per std.	22	10	0	to 32	10	0	
2nd do. do. ...	,,	17	0	0		22	0	0
3rd do. do. ...	,,	11	10	0		13	0	0
St. John, Miramichi, etc., Spruce	,,	7	10	0		7	15	0
Nova Scotia Spruce ...	,,	7	7	6		7	12	6
Spruce Boards	,,	6	7	6		6	12	6

UNITED STATES, etc., WOODS.

Pitch Pine.

		£	s.	d.		£	s.	d.
Hewn	per cub. ft.	0	1	4	to 0	1	8	
Sawn	,,	0	1	0		0	1	6
Planks, Stowage	,,	0	0	10		0	1	0
Boards, Prime ...	per std.	12	10	0		16	0	0
Oak Timber	per cub. ft.	0	1	6		0	2	6
Oak Planks	,,	0	1	6		0	2	1
East India Teak ...	per load	12	0	0		19	0	0
Greenheart...	,,	6	15	0		7	10	0

EUROPEAN WOODS.

Timber.

		£	s.	d.		£	s.	d.
Riga Redwood	per cub. ft.	0	1	6	to 0	2	0	
Dantzic and Memel Fir, Crown	,,	0	2	1		0	2	6
Dantzic and Memel Fir, Middling	,,	0	1	9		0	1	11
Stettin	,,	0	1	9		0	1	11
Swedish	,,	0	1	0		0	1	3
Riga Whitewood	,,	0	1	0		0	1	3
Norway Mining Timber	,,	0	0	9		0	1	0
Dantzic and Stettin, etc., Oak...	,,	0	2	6		0	3	0
Norway Spars	,,	0	1	2		0	1	9

Deals.

Red Archangel and Onega, 1st quality ...	per std.	19	0	0		20	0	0
Red Archangel and Onega, 2nd quality	,,	14	0	0		16	0	0
Red Archangel and Onega, 3rd quality ...	,,	10	10	0		12	10	0
St. Petersburg, 1st quality...	,,	16	0	0		17	10	0
Do. 2nd ,, ...	,,	14	0	0		15	0	0
Gefle ...	,,	11	10	0		16	0	0
Wyburg	,,	11	0	0		12	10	0
Uleaborg	,,	10	0	0		12	10	0
Gothenburg	,,	11	0	0		16	0	0

SELECTED PATENTS.

Compiled expressly for this Journal by **Messrs. Page and Rowlingson, Engineering Patent Agents, 28, New Bridge Street, London, E.C.,** and at Manchester.

Copies of Specifications may be obtained at the Patent Office Sale Branch, 25, Southampton Buildings, Chancery Lane, W.C., at the uniform price of 8d.

NEW PATENTS APPLIED FOR.

When patents have been communicated the names of the communicators are printed in *italics*.

19900. L. Feiner and C. Zanini, London. Oct. 2nd. Improvements in or relating to car couplings.

19902. C. A. Arbey, London. Oct. 2nd.—Improvements in irreversible controlling apparatus.

19908. W. Cassie, Surrey. Oct. 3rd.—A variable speed gear.

19912. S. Z. De Ferranti, London. Oct. 3rd. Improvements in or relating to turbine engines.

19940. H. Tomlinson, Manchester. Oct. 3rd. Improvements in automatic couplings.

19995. J. A. Hutmacher, London. Oct. 3rd. Improvements in and relating to the carburation of gases.

20003. F. M. Weymouth, London. Oct. 3rd. Improvements in air carburetting apparatus for internal combustion motors. (Date applied for Oct. 10th, 1904.)

20028. J. Hamilton, Glasgow. Oct. 4th.—Improvements in and connected with turbine blades.

20073. O. N. Rikof, London. Oct. 4th.—Improvements in or relating to speed indicating and recording apparatus.

20077. Willans and Robinson, Ltd., and J. C. Peache, London. Oct. 4th.—Improvements in steam turbines.

20106. H. J. Simmons, London. Oct. 5th.—High tension distributor for electric ignition of internal combustion engines of more than one cylinder which is worked by one induction coil.

20127. F. J. Stawell, Manchester. Oct 5th.—A new or improved ignition regulator for explosion engines and for the like purposes.

20156. G. A. Nassbaum, London. Oct. 5th. Improvements in rotary engines actuated by steam or other elastic fluids.

20160. P. R. J. Willis, Kingston-on-Thames Oct 5th. An improved engine. (*R. P. Medre, Canada.*)

20167. A. Vogt, London. Oct. 5th.—Improvements in internal combustion motors.

20182. M. Churchill-Shann, London. Oct. 5th. — Improvements in or relating to steam [illegible].

20193. H. P. Mason, Lancs. Oct. 6th.—Improvements in starting arrangements for internal combustion engines.

20201. R. Richardson, Glasgow. Oct. 6th.—Improvements in pumps.

20202. W. Weir, London. Oct. 6th.—Improvements in steam engine air pumps.

20221. P. Browne, London. Oct. 5th.—Gear for changing reciprocating motion into rotary motion.

20251. J. Dideir, London. Oct. 6th.—Improvements in and relating to change speed gears. (Date applied for Sept. 6th, 1905).

20275. A. J. Cooper, Liverpool. Oct. 7th.—Improvements in turbines.

20321. F. C. Yeo, London. Oct. 7th.—Improvements in or relating to variable speed gear.

20325. P. G. Challiss, London. Oct. 7th.—Improvements in internal combustion engines.

20326. P. G. Challiss, London. Oct. 7th.—Improvements in internal combustion engines.

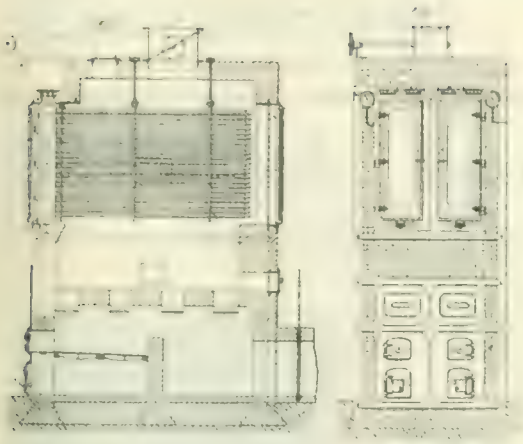
19856. W. W. May and A. Dunlop, London. Oct. Improvements in reversing gear for internal combustion engines.

19898. O. H. Bayldon, London. Oct. Improvements in or relating to internal combustion engines.

RECENT SPECIFICATIONS.

IMPROVEMENTS RELATING TO APPARATUS FOR SUPERHEATING OR DRYING STEAM.

Hugh McPhail, Wakefield. September 7th, 1905.—This invention relates to apparatus for superheating or drying steam, and has special reference to the construction and arrangement of the boxes or headers of the superheaters and to a separately fired structure embodying the furnace or furnaces for heating said superheaters when they are not intended to be heated by the combustion gases coming from the furnace of a steam generator. In the accompanying drawings fig. 1 is a longitudinal section of the improved apparatus. Fig. 2 is an end view of the same as seen from the left of fig. 1. Fig. 3 is a plan of the said apparatus, and figs. 4 and 5 are respectively a horizontal and vertical sections. Fig. 6 is a sectional elevation, and fig. 7 a plan of one of the headers detached. Fig. 8 is an elevation as seen from the right of fig. 7. Figs. 9 and 10 are transverse



sections of the said header drawn on an enlarged scale.

In the drawings is shown a brickwork structure in which the superheaters are adapted to be arranged when they are to be heated independently of a steam generator furnace. At the lower part of this structure are situated the grate bars of the furnace which has an arched crown provided with holes therein for the gaseous products of combustion from the furnace to reach the superheating chamber. Boxes or headers of the superheaters are also shown which are adapted to receive the ends of the superheating tubes. The said headers are formed of solid drawn steel tubes of square or other rectangular shape in cross section, to one end of which may be closed by a plate suitably riveted or otherwise connected thereto, and the other end of which may be furnished with a flanged ring forged, welded, riveted, or otherwise formed thereon or connected thereto ; this end of the box or header may be suitably contracted to bring it to cylindrical shape for the reception of the flanged ring. At appropriate intervals the said box or header is provided with transverse stays for imparting increased strength thereto, the position of these being such that they will not interfere with the introduction of the expanding tool used for enlarging or expanding the ends of the superheating tubes in forming a joint where they enter the box or header. The said box or header is also formed with suitably arranged handholes closed by covers and appropriately situated for enabling the workmen to manipulate the expanding tool during the said expanding operation.

The superheaters may be arranged in the path of the products of combustion from the steam generator or other furnace, and the superheating tubes may lie vertical with their headers horizontal, or they may lie horizontal with their headers vertical or at any angle relatively to each other. The structure comprising the header or headers and the superheating tubes may be arranged vertically, horizontally, or at an angle, or the tubes may be bent to any desired shape to suit the space available in the path of the combustion gases and to obtain the full benefit of the heat from the same. In all cases the superheating tubes are supported by perforated plates depending from suitable supports or otherwise held in place within the space or chamber containing the superheating tubes. In some cases between the aforesaid perforated plates, baffles are provided for defecting the products of combustion from their path to the flue or flues and directing them amongst the superheating tubes. If the superheaters be situated in an independently fired structure the flue or flues are arranged in a straight or diagonal direction relatively to the said structure. Suitable dampers are provided for regulating the draught through the flues and amongst or around the superheating tubes. The furnace may be fed with fuel in the ordinary manner or by any appropriate form of mechanical stoker, or the superheater may be fired with gas generated for the

Fig. 3

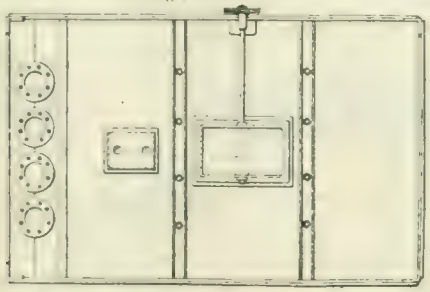
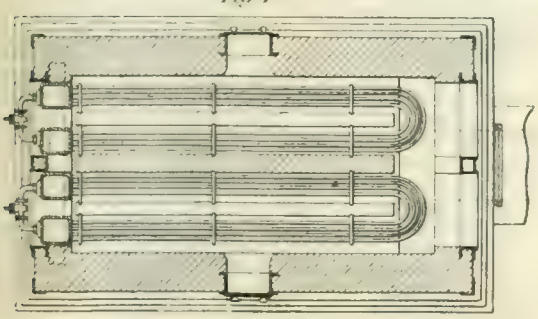
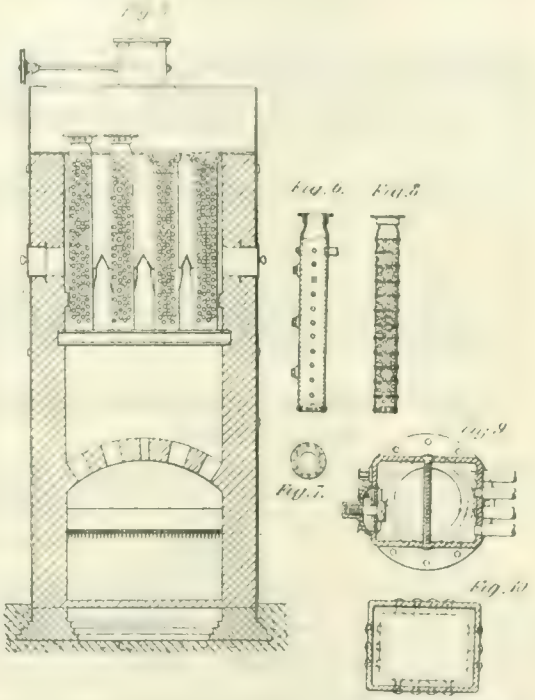


Fig. 4





NEW PUBLICATIONS.

"GRAPHIC METHODS OF ENGINE DESIGN.

Including a graphical treatment of the reducing motion. By Arthur H. Barker B.A., B.Sc. Second Edition. The Technical Publishing Company, Ltd., Manchester. 3s. 6d. net.

The fact that this concise little work has now entered upon its second edition should be sufficient to indicate the value of the volume to the young mechanic. Starting with the assumption that the reader has a general acquaintance with the construction of an ordinary steam engine and an elementary knowledge of mathematics and mechanics, the author aims primarily at describing and explaining a series of easy constructions for use in the drawing office. Many of these were devised by the author for working purposes, and, having been personally tested by him, their practical utility is assured. The second object, says the writer, is to show the intimate relation that must necessarily exist between the science of engineering and the exact principles of theoretical mechanics. The introductory chapter discusses the size of engine for given power. Consideration is then accorded to valves, posts, and valve diagrams; dimensions of details; compounding; compound diagrams; flywheels; theory of inertia of moving parts; inertia diagrams; the motion of the connecting rod; balancing-force curves; methods of force-balancing; the theory of couples; inertia couples on an engine; the balancing of two-cylinder engines with cranks at right angles, concluding with some general remarks on balancing.

"PRACTICAL ELECTRIC WIRING FOR LIGHTING INSTALLATIONS.

Suitable for foremen wiremen, students and for all those who wish to acquire a practical knowledge of wiring, jointing, and fitting, for the installation of the electric light. By Charles C. Metcalfe A.M.I.E.E. Harper and Bros. 5s. net.

It is quite obvious that when Mr. Metcalfe undertook the compilation of this handbook he set himself the task of producing a work which the average practical man could readily assimilate. Viewed from this standpoint, the result is all that can be desired, for although the author has but little to say that is not already known to the electrical engineer, his lucid presentation of a subject more or less complicated, renders the publication decidedly useful. At the outset such terms as ohms, amperes, volts, and Board of Trade units are carefully defined; examples of the fitting, erection, and connecting up of the electrical appliances which go to make up an installation are then given, the author incidentally calling attention to the urgent necessity of standardisation in all electrical matters. Several chapters are devoted to accessories, systems, wires and cables, and flexible conductors. The rules for jointing are worthy of special attention; the best method of cutting cable ends is depicted, and a number of diagrams are introduced to illustrate the means of taping insulated joints. The concluding chapter on the installation deals with the execution of the work as set out in the specification, schedule, and plans of the self-contained private house installation. A number of plans are included in this section, which could be easily modified to suit any installation. The diagrams and photographs used throughout the work are uniformly good.

NEW CATALOGUES.

The Simplex Steel Conduit Company, Ltd., Birmingham.—We have pleasure in acknowledging the receipt of a new price sheet, which gives in a condensed form most of the prices in the firm's 1905 catalogue. The list has been compiled to meet the wishes of customers for a compact and legible sheet, which can be hung up in the office or folded for the pocket. For these purposes it is likely to be much in demand.

Lionel Robinson and Co., Ltd., Barnes, Dutton. A price list of switches, fuses, cut-outs, regulators, etc., is bound up by this firm in sheet form in a cover, which will readily admit of additions. Special attention is given to switchboards, and water-tight switch-boxes are prominently illustrated. The prices are clearly set out, and we note the manufacturers' claim that they are arranged to meet the demands of those who require a well-made English article at foreign prices.

Herbert Morris and Bastert, Ltd. Loughborough.—Book 47 chiefly describes and illustrates Class 44 electric crane, designed to lift 2½ tons and having a 25 ft. span. The cranes are of the three-motor type having a motor for each motion. In order to bring them entirely within the range of popular demand, it has been arranged that any motion may be hand-worked, and the crane may be electric in one or two only of its motions if desired. Where the longitudinal motion is chosen hand worked, it may be fitted with roller-bearings, so as to travel with about one-quarter the usual hand-effort.

A. P. Lundberg, 175 to 185, Liverpool Road, London, N., forwards an illustrated catalogue of electrical accessories, a number of pages being devoted to various applications of the "Duplex" and "Pivot" tumbler switches. Prominence is given to armoured types of wall plugs for use with standard "Dot" and "Universal" surface and flush sockets. These are constructed of metal and porcelain only. The interior consists of two pieces of porcelain, and between these is arranged a patent cord-gripping device with slanting holes, which facilitates wiring up. By the use of a specially shaped washer in the roof, the porcelain parts are all fixed within their shells, without any unsightly screw ends protruding.

J. P. Hall and Co., Oldham.—The firm's new illustrated booklet, No. 25, contains eighty pages of illustrations of their manufactures, comprising dynamos and motors, for both continuous and alternating current, steam engines, electric winches, patent liquid starters, speed-controlling and reversing switches, etc., etc. Their application to machine tools, cranes, pumps, shipyard machinery and mining plant is also fully illustrated, this section being of great interest. The firm's enclosed ventilated rain-proof motor is seen at work driving a sinking pump working out in the open, driving shipyard tools, operating a coal conveyor, etc. Many other examples of electric driving are given, rendering the catalogue of considerable value to those who are in search of recent information on this subject.

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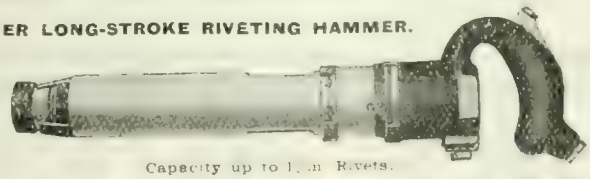

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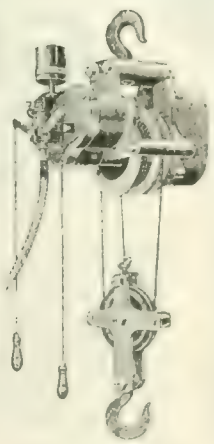

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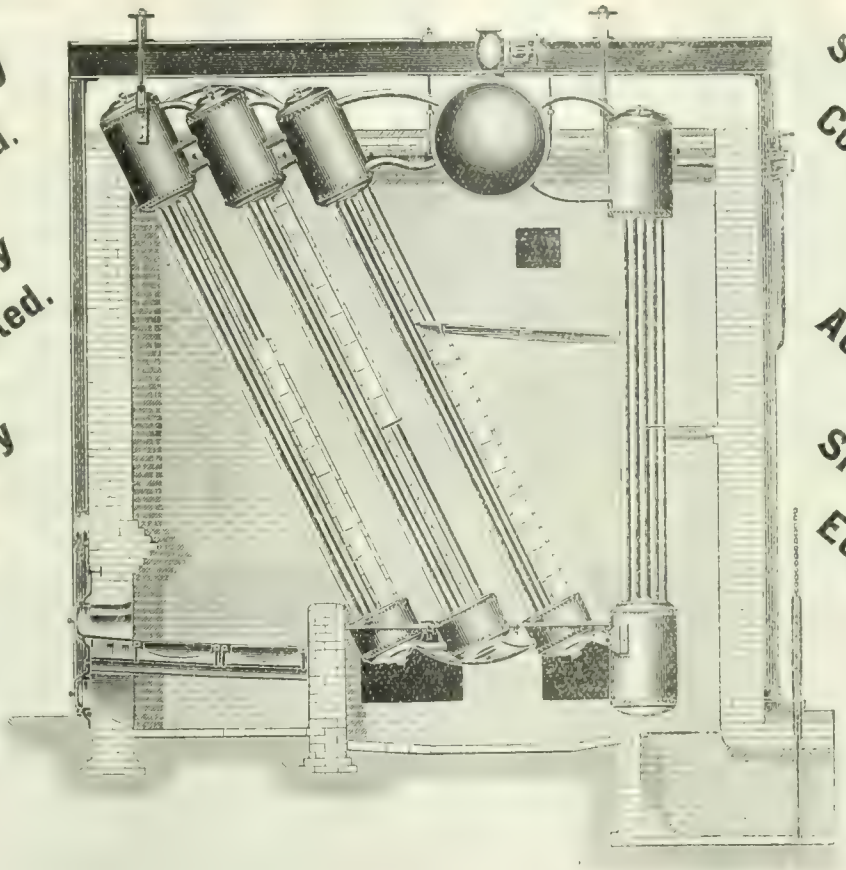

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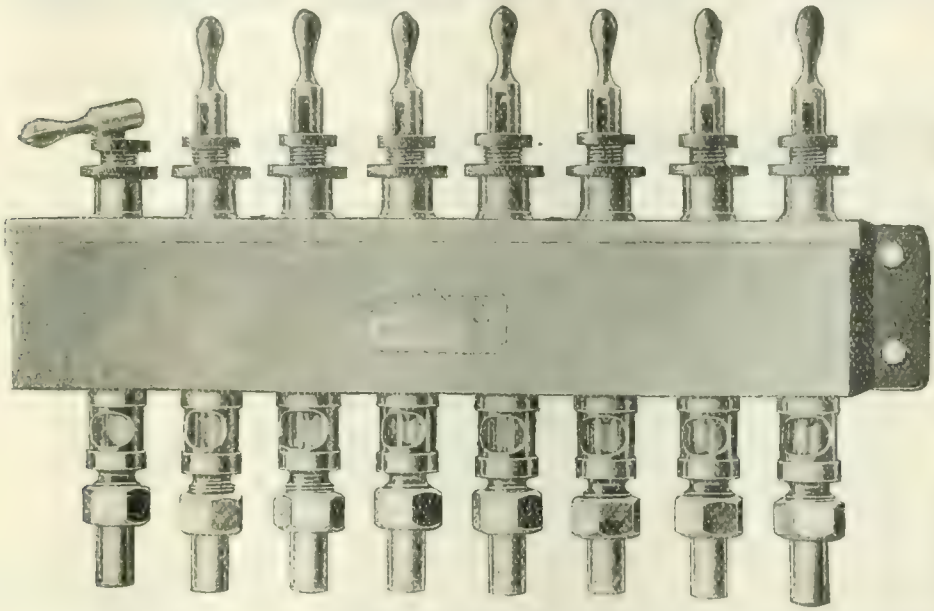

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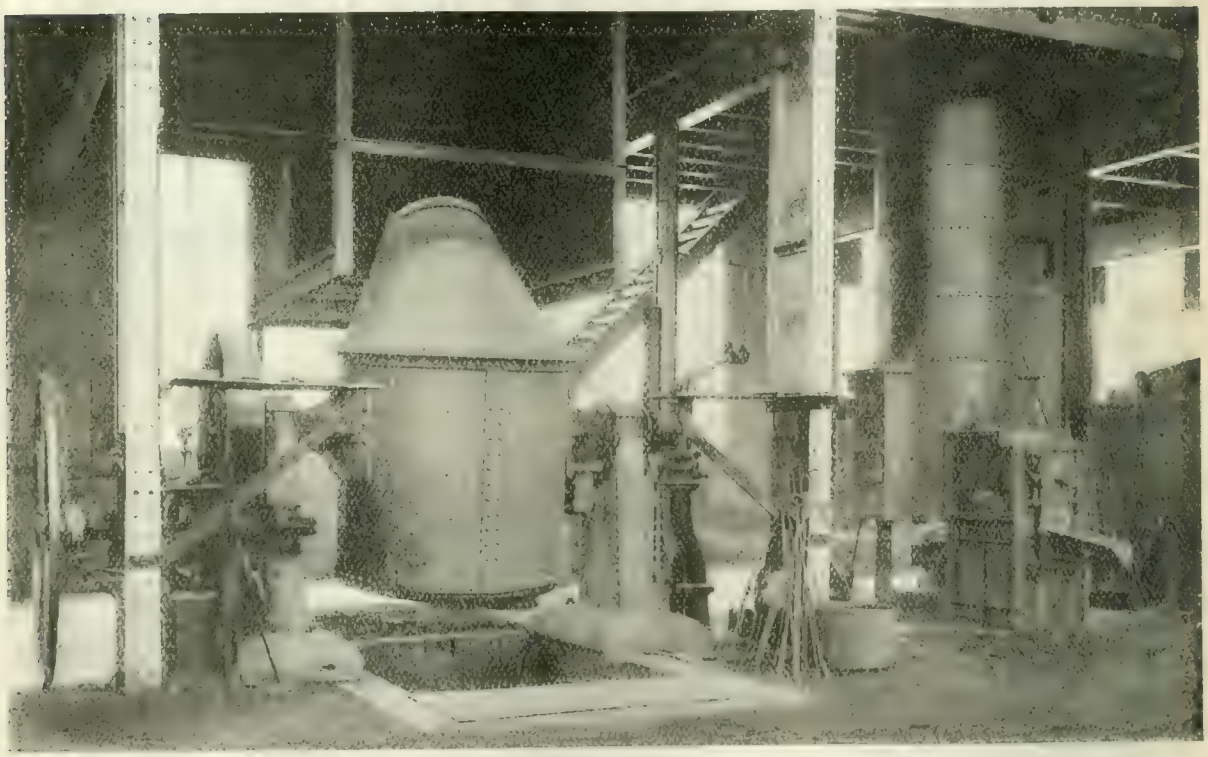

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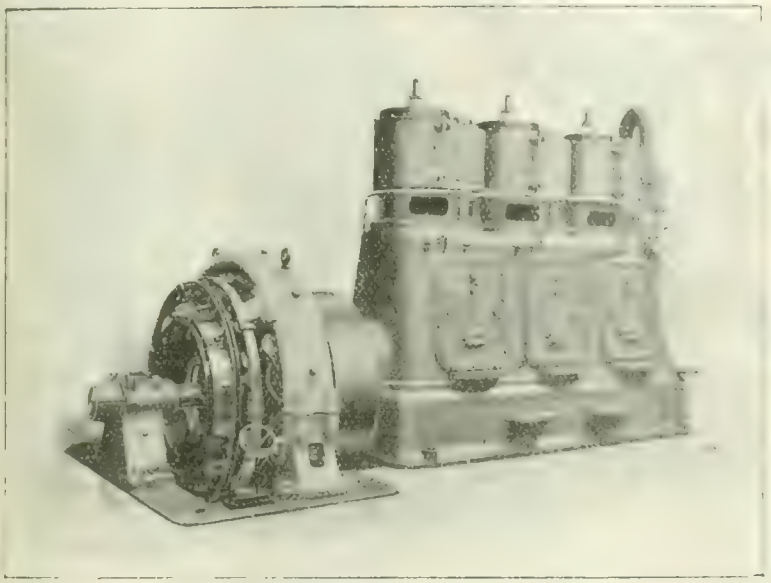

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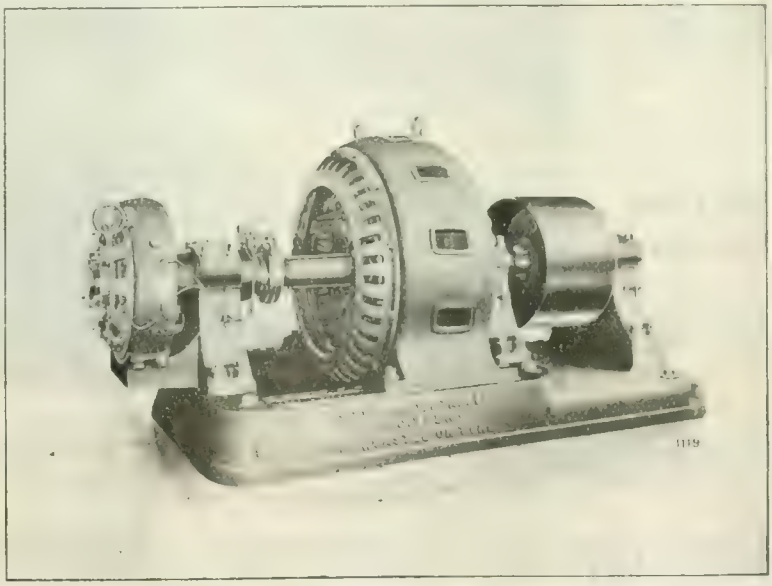

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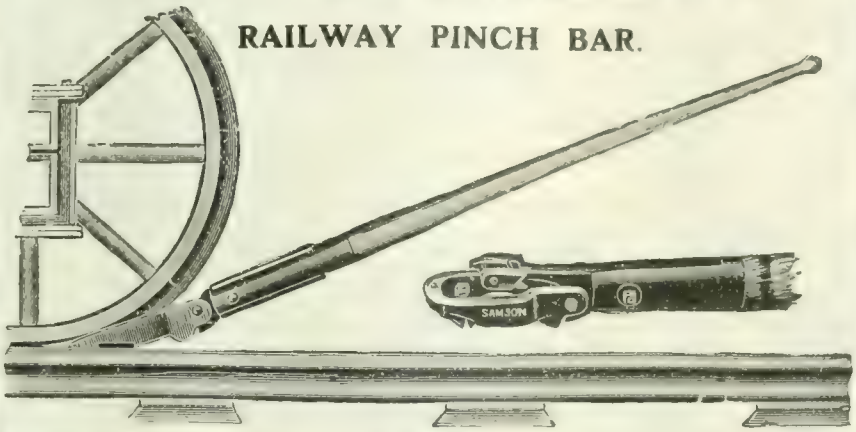

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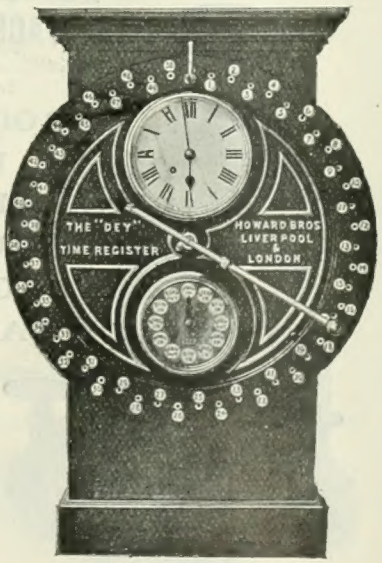

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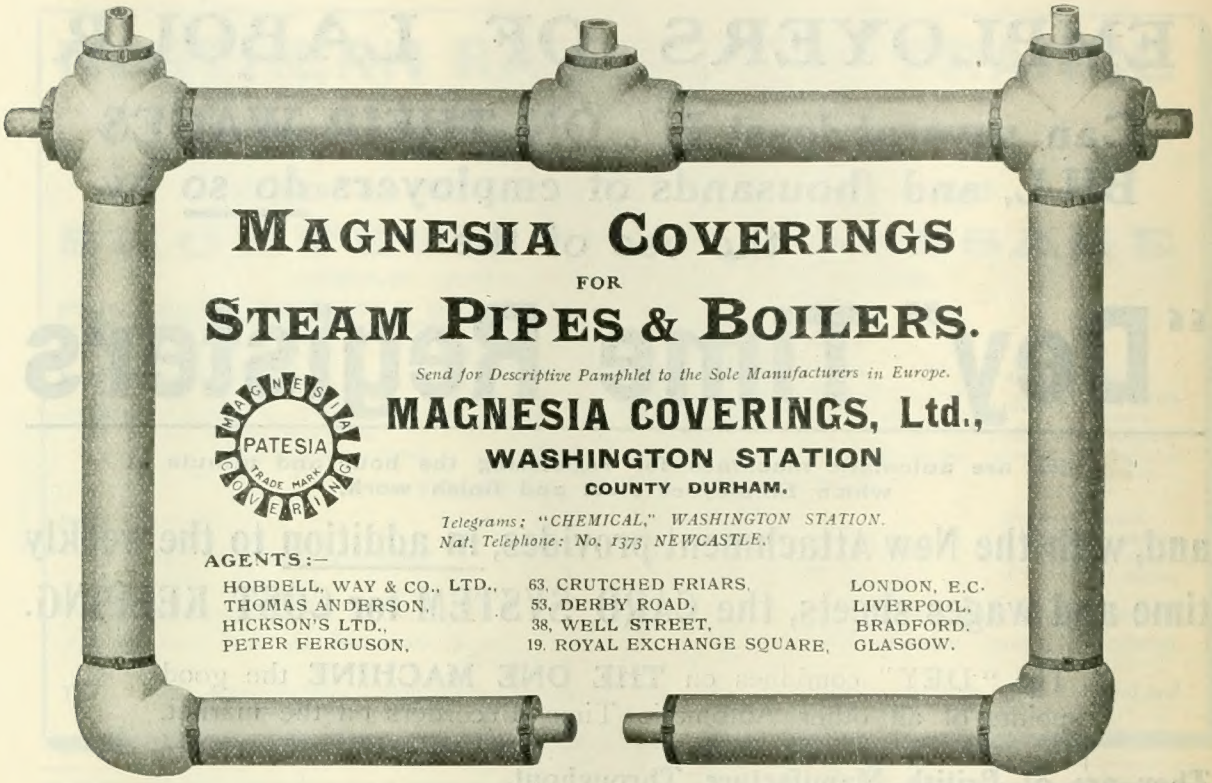

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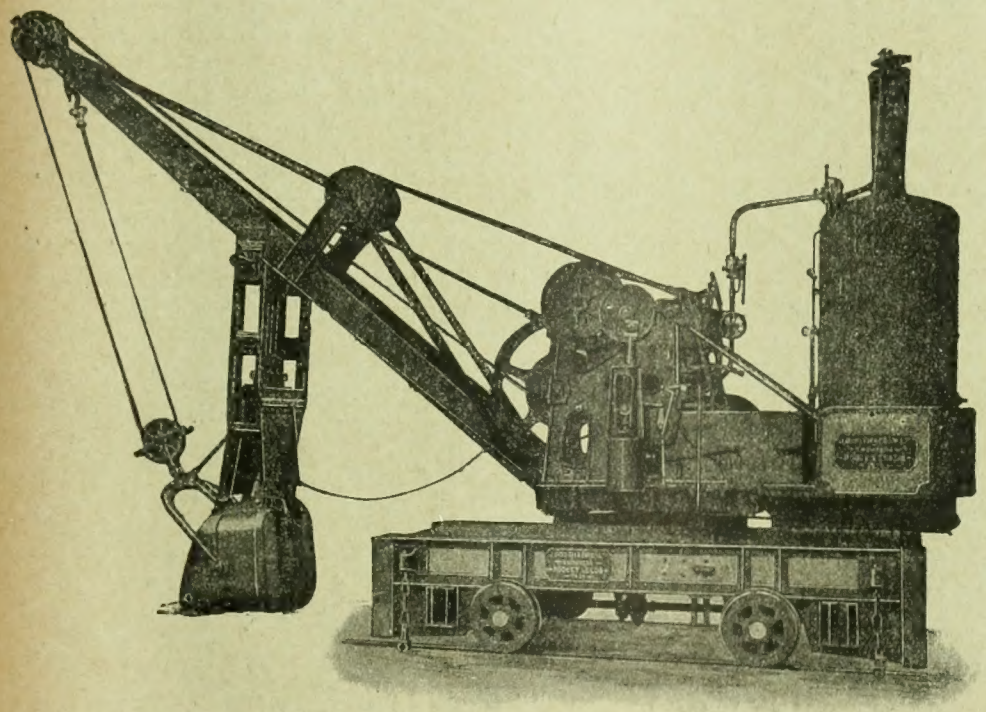

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